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WARZYN

Technical Memorandum
Project No. 60251

Phase II
Volume 1 of 5
Technical Memorandum
ACS NPL Site
Griffith, Indiana

Prepared for:
Steering Committee
ACS PRP Group

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PHASE II TECHNICAL MEMORANDUM
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

October 19, 1990

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SECTION 1
INTRODUCTION

1.1 PURPOSE OF REPORT

This Remedial Investigation (RI) was performed to provide the data necessary for the completion of a Feasibility Study (FS) which will identify, evaluate, and prepare conceptual designs for remedial alternatives at the American Chemical Services (ACS) Site. The RI data collection activities were designed to meet the following objectives.

- To determine if the ACS Site poses a risk to public health, welfare, or the environment;
- To confirm or deny expected locations of hazardous substances on the site;
- To evaluate locations of suspected contamination on the site;
- To determine the extent and character of hazardous and/or toxic materials present at the site, including the horizontal and vertical distribution of potential sources of contamination;
- To determine the physical and chemical properties of each identified source area containing hazardous and/or toxic materials;
- To determine the nature and extent of actual and potential releases from source areas;
- To characterize the known and potential pathways for release of contaminants from source areas. Characterization of pathways includes evaluation of physical properties governing transport within given pathways; and
- To determine and document the type, extent, and magnitude of contamination of media by hazardous substances, as necessary, to assess endangerment to human health and the environment and to perform a FS.

The Final Work Plan for the ACS Site defined 11 tasks to be completed during the RI:

- Task 1 - Problem Definition
- Task 2 - Hydrogeologic Investigation
- Task 3 - Near Surface Contamination Investigation
- Task 4 - Phase II Site Characterization
- Task 5 - Feasibility Study Testing
- Task 6 - Data Validation
- Task 7 - Contaminant Pathway and Transport Evaluation
- Task 8 - Endangerment Assessment
- Task 9 - Remedial Investigation Report
- Task 10 - Community Relations Support
- Task 11 - Quality Assurance
- Task 12 - Technical Management

Subsequent to the approval of the Final Work Plan, a Supplemental Work Plan for the Phase II Remedial Investigation and a Supplemental Technical Investigation were developed and approved.

The scope of work for Task 1 was addressed through the submittal of Technical Memoranda and will be completed with submittal of the Draft RI Report. No work was required under Task 5 and Task 10. The submittal of the Draft RI Report will complete the scope of work for the remaining tasks, with the exception of Task 9. Task 9 will be complete with the submittal of the Final RI Report.

The types of data collection activities performed during the RI, and the presentation of the data obtained, are summarized in Table 1-1.

1.2 ORGANIZATION OF PHASE II TECHNICAL MEMORANDUM

This technical memorandum presents the data collection activities performed during the RI and the actual data collected. It is excerpted from the planned Draft RI Report, and is comprised of Sections 1-3 of the Draft RI Report with applicable figures, tables, and appendices. The planned organization of the Draft RI Report is presented in the following section.

1.3 ORGANIZATION OF DRAFT RI REPORT

The planned organization of the Draft RI Report is as follows. The report will be comprised of 5 volumes. The volumes may be referenced by their respective contents which will be as follows:

Volume I	Draft RI Text with Tables and Figures
Volume II	Appendices A - H
Volume III	Appendices I - P
Volume IV	Appendix Q
Volume V	Appendix R

The Draft RI Report describes the performance and findings of the RI. Data collected prior to the initiation of the RI is considered, however, the majority of the analysis of site conditions relies on data collected as part of the RI.

In addition to a description of the purpose of the RI and the report organization, Section 1 of the Draft RI Report provides a summary of the Site history, including site operations and previous investigations and is based on documentation submitted to EPA by ACS, personal interviews by Warzyn and other field notes. Section 2 presents the details of the field procedures used to collect the data. Section 3 describes the field observations in narrative form to provide the conceptual approach and logical sequence followed during the two-phased investigation. Section 4 contains a detailed characterization of the setting of the site, including topography, geology, hydrology, and hydrogeology. Section 5 provides a description of the nature and extent of contamination in the media across the site. Section 6 provides a discussion of Contaminant Fate and Migration and Section 7 presents the Endangerment Assessment.

1.4 SITE BACKGROUND

1.4.1 Site Description

The American Chemical Services (ACS) NPL Site (Site) is located at 420 South Colfax Avenue in Griffith, Indiana. The Site is located in the northeast one-

quarter of the southeast one-quarter, Section 2, Township 35 North, Range 9 West, Lake County, Indiana (Figure 1-1). Although the Site name is ACS, the United States Environmental Protection Agency (U.S. EPA) has defined the Site as including the ACS property (19 acres) the Pazmey Corporation property (2 acres; formerly Kapica Drum, Inc.) and the inactive portion of the Griffith Municipal Landfill (about 15 acres).

Six areas of probable waste disposal have been identified at the Site, based on preliminary reports and the review of aerial photographs. These six areas have been assigned the following designations by U.S. EPA and ACS management: the On-Site Containment Area, the Still Bottoms Area, Treatment Lagoon #1, the Off-Site Containment Area, the Kapica/Pazmey Area, and the Griffith Municipal Landfill. These designations will be used throughout this report to facilitate discussions about the Site. The location of each area is illustrated in Figure 1-2.

1.4.2 Site History

As described in the previous section, the Site consists of ACS, the inactive portion of the Griffith Municipal Landfill, and the Pazmey Corporation property (Kapica Area). ACS is an active solvent recovery and chemical manufacturing facility operating under RCRA Part B Interim Status. The Griffith Municipal Landfill is an active solid waste facility. Pazmey corporation is no longer in operation.

The following sections summarize the history of the Site's operations, as described in available historical documents. Particular documents and resources used to construct the Site history include: aerial photos (Appendix A), "Initial Site Evaluation (Site 160) American Chemical Service, Griffith, Indiana", Camp Dresser & McKee Inc., 3/26/85 and "Aerial Photographic Analysis of Three Priority CERCLA Hazardous Waste Sites", EMSL, Office of Research and Development, U.S. EPA, 7/85. Other references utilized include interviews with ACS management, U.S. EPA files, Indiana State Board of Health (ISBH) Inspection Records, and previous reports developed for the Site. Information

regarding Site operations was obtained during a November 1989 audit of the ACS facility by Warzyn personnel. The results of this audit are presented in Appendix B.

1.4.2.1 History of Site Operations

ACS began operations as a solvent recovery facility in May 1955, and according to ACS personnel, solvent reclamation was the only operation performed on-Site until the late 1960s. Other operations performed at ACS include small batch manufacturing, epoxidation, incineration, and secondary fuel blending. For purposes of discussing the history of ACS's operations, these operations will be divided into the following time intervals: pre-1970, 1970 to 1975, and 1975 to present. The development of the site is illustrated in the aerial photographs contained in Appendix A.

Pre-1970. ACS began operations in 1955, with reclamation of spent solvent waste being the only plant process. Reclamation was performed almost exclusively in batch evaporation units, which were charged by pumping directly from 55-gallon drums into the distillation units. Spent solvents were generally stored in 55-gallon drums at storage areas located throughout the Site.

Small batches of specialty chemicals were first manufactured at ACS in the late 1960's and early 1970's. These early manufacturing operations included treating rope with a fungicide, bromination, and treating ski cable.

ACS installed its first incinerator in 1966, and a second in 1969. The incinerators were used to burn still bottoms and non-reclaimable materials generated at the Site, and off-Site wastes. The incinerators were removed from the Site in 1970, when their operation was discontinued.

1970 to 1975. Reclamation of spent solvents continued to be the primary operation at ACS throughout this period. However, an increasing percentage of shipments were received in bulk tanker trucks. A spent and reclaimed solvent

tank farm was constructed just east of the existing spent solvent tank farm. The distillation operation remained essentially the same, except that a fractional distillation column was added.

The batch manufacturing processes were expanded during this time period. A lard oil process which utilized tallow and animal rendering was used to manufacture a lubricant product. In 1971, the additive manufacturing area was built. Various detergents, lubricants, and chemical additives were manufactured, in addition to soldering flux. Raw material used in the manufacturing processes included xylene, furfural alcohol, various amines, methanol, formaldehyde, sodium hydroxide, and maleic anhydride. High boiling point aromatic solvent blends (boiling points higher than xylene and toluene) were utilized as reflux solvents.

The epoxidation plant was constructed in 1974. The epoxidation process creates a plasticizer. Materials used in the process include hydrogen peroxide, linseed oil, formic acid (catalyst), benzene (reaction solvent), and butanol.

1975 to Present. Distillation units for solvent recovery have been replaced, but the types of units remain essentially the same. Solvent recovery remains the principal operation at ACS. The spent solvent and reclaimed solvent tank farms which currently exist were constructed during this time period. The majority of spent solvent waste streams are shipped in bulk tanker trucks, although drummed wastes are still processed. The current elevated hazardous waste drum unloading dock and storage area were built in the early 1970's, with spill containment curbing and a sump area being subsequently added.

The small batch manufacturing processes described in the preceeding section remained essentially the same over this time period. However, the lard oil and soldering flux manufacturing operations were discontinued.

The epoxidation operations described previously have remained essentially the same. However, toluene has replaced benzene as the reaction solvent. A bromination operation, utilizing hexane as the carrier solvent, was added in 1975.

The injection tank farm area, previously used for the former incinerator, is now used to store and blend waste streams for ACS's secondary fuel program. Waste streams are received from bulk tanker trucks, and in drummed form. The secondary fuels are loaded from the storage tanks into railcars or bulk tanker trucks.

Operations at the Griffith Municipal Landfill and Kapica/Pazmey Corp. The Griffith Municipal Landfill has been an active solid waste disposal facility since the 1950's. Kapica Drum, Inc. began operations in 1951. Operations at Kapica Drum, Inc. consisted of drum reconditioning. Kapica Drum was sold to Pazmey Corporation in February 1980. The Pazmey Corporation property was sold to Darija Djurovic in March 1987.

1.4.2.2 History of Site Disposal Practices

Table 1-2 provides a summary of disposal practices at the ACS Site. Details regarding disposal practices are presented in the following sections. The development of the different disposal areas is illustrated in the aerial photographs contained in Appendix A.

Still bottoms for the solvent recovery process were originally disposed of in the Still Bottoms Pond and Treatment Lagoon #1. The Still Bottoms Pond is visible in the aerial photograph taken in 1958 (Appendix A). Treatment Lagoon #1 is illustrated in the 1970 photograph. The Still Bottoms Pond and Treatment Lagoon #1 were taken out of service in 1972. At this time, these two areas were drained and filled in with drums partially full of sludge materials. A portion of Treatment Lagoon #1 may have been incorporated into the present-day fire pond when it was constructed in November 1973.

Between 1958 and 1975, the Off-Site Containment Area was utilized as a waste disposal area. This area is located south of the present facility (See Figure 1-2). The evolution of this area as a waste disposal area is illustrated in the aerial photographs contained in Appendix A. The area appears tree-covered and inactive in the 1950 aerial photograph. In the 1970 photograph, numerous drums are present in this area. In the 1973 photograph, the Off-Site Containment Area appears covered and inactive.

A variety of wastes were disposed of in this area, including the still bottoms from the Still Bottoms Pond and Treatment Lagoon #1. Between 1968 and 1970, wastes from on-Site incinerators were disposed of in this area. General refuse, an estimated 20,000 to 30,000 drums, and a tank truck partially full of solidified paint were also disposed of in the Off-Site Containment Area. It has been reported that the drums were punctured prior to disposal.

Use of the Off-Site Containment Area was discontinued in 1972, and the area was reportedly capped with 2 to 3 feet of soil. In 1980, a 31-acre parcel of property to the west of the Off-Site Containment Area was sold to the City of Griffith for an expansion of the City's municipal landfill. This transaction reportedly included a strip along the west edge of the Off-Site Containment Area.

During the mid-1960's, landfilling of drums was performed in the On-Site Containment Area (See Figure 1-2). Approximately 400 drums containing sludge and semi-solids of unknown types were reportedly disposed of in the On-Site Containment Area. The use of on-Site areas for drum storage is evident in the 1970 aerial photograph contained in Appendix A.

The incinerators previously mentioned operated between about 1966 or 1968 and 1970. Over this time period, approximately 2 million gallons of on-Site and off-Site waste were reportedly burned per year in the incinerators.

At the present time, still bottoms from the solvent reclamation operations are disposed of off-Site. Waste solvents are either disposed of off-Site, or disposed of in ACS's secondary fuel blending program. Wastewater originating from the solvent reclamation, small batch, and epoxidation operations, as well as non-contact cooling water and water from boiler blowdown operations, is routed to the City of Griffith sewer system.

The Griffith Municipal Landfill has been in operation since the 1950's. Prior to the implementation of RCRA, wastes from ACS and Kapica Drum, Inc. were reportedly disposed of at the landfill. Currently, the landfill accepts solid waste.

Kapica Drum, Inc. (later Pazmey Corporation) operated between 1951 and 1987. Kapica Drum, Inc. was sold to Pazmey Corporation in February, 1980. Rinse water from drums containing hazardous wastes was reportedly disposed of on the property, as were liquids from the drums to be reconditioned. Liquid waste from the drum washing operations at Kapica/Pazmey reportedly flowed onto ACS property intermittently between 1962 and 1983.

1.4.3 Previous Investigations

The first documented regulatory agency concern for the ACS facility was apparently expressed by the Indiana State Board of Health (ISBH) on April 12, 1972. Table 1-3 provides a chronology of site events and regulatory agency activities. This table has been modified from CDM, 3/26/85, Table 1.

During an inspection on April 12, 1972, the ISBH noted a number of environmental problems at the ACS Site, including the discharge of liquids onto the ground. Over the period April 1972 to September 1973, numerous inspections of ACS were made by the ISBH. Concerns during these inspections centered around waste handling, spill prevention, and site maintenance. During the period September 1974 to September 1975, ISBH interest in the Site centered on allegations of discharging chemicals to the sanitary sewer and dumping chemicals

on-site. There was little ISBH activity concerning ACS between September 1975 and December 1982 (CDM, 3/26/85).

U.S. EPA activities involving ACS began in February of 1980. At this time, U.S. EPA Region V made an Identification and Preliminary Assessment of ACS as a potential hazardous site (CDM, 3/26/85).

The first sampling at ACS by U.S. EPA was performed in May 1980 by the U.S. EPA Environmental Emergency and Investigation Branch. The purpose of this sampling was to determine if off-site migration of waste or leachate was occurring. This sampling event centered on the Off-Site Containment Area and the Griffith Landfill. Samples were obtained of soil, leachate and surface water (USEPA, 5/8/80). A variety of organic compounds were found present in the samples analyzed, including phenol, isophorone, napthalene, fluorene, phenanthrene, anthracene, bis (2-chloroethyl) ether, and phthalates (CDM, 3/26/85 and Weston, 10/23/89).

On September 9, 1980 an on-Site inspection/investigation was performed by the U.S. EPA Field Investigation Team (FIT). Noted during this investigation were a leachate spring along the northeast side of the Off-Site Containment Area, vegetation damage, and partially exposed drums (Ecology and Environment, 9/11/80).

In July, 1982, the U.S. EPA FIT installed four monitoring wells near the Off-Site Containment Area and the Griffith Landfill. Sampling of these wells indicated the presence of several volatile organic compounds, including chloroethane, benzene, and vinyl chloride (Weston, 12/84).

In June, 1983, an HRS score was assigned to the ACS Site. This score consisted of: Groundwater Route Score, 59.86; Surface Water Route Score, 8.89; Air Route Score, 0.00; Overall Average Score, 34.98.

On November 29, 1984, a site assessment of the ACS Site was performed by the U.S. EPA Technical Assistance Team (TAT). This site assessment centered on the Off-Site Containment Area and Treatment Lagoon #1. On December 12, 1984, the TAT made a Spill Prevention, Countermeasure, and Control (SPCC) inspection of the facility. No conditions were noted which could pose an imminent threat to the public safety, other than an abandoned fuel tank on the Off-Site Containment Area (Weston, 12/84).

In 1984, ATEC Associates, Inc. (ATEC) performed a Preliminary Hydrogeologic Site Assessment for ACS. This investigation consisted of the installation of soil borings, monitoring wells, groundwater sampling and analysis, water level measurements, and a site geophysical survey. Organic chemicals detected in the groundwater monitoring wells included benzene, ethylbenzene, toluene, and other acid/base/neutral compounds (ATEC, 1/14/85).

Preliminary planning documents for the RI/FS at ACS were developed for the U.S. EPA by Roy F. Weston. In 1986, a group of approximately 125 potentially responsible parties (PRPs) appointed a nine-member steering committee to organize, oversee and determine funding for the RI/FS. In conjunction with the U.S. EPA and the Steering Committee, Warzyn developed a Work Plan for the RI/FS in April 1988. The Work Plan was subsequently approved by the U.S. EPA. The field investigation for Phase I of the RI began in July of 1989.

On June 1, 1989, the U.S. EPA TAT conducted sampling at the Griffith Landfill. Two surface water samples, and one soil sample were collected. Numerous VOCs were detected in the samples, but were also detected in the blanks. Acid/base/neutral compounds were detected in one of the water samples (Weston, 10/23/89).

SECTION 2
INVESTIGATION METHODOLOGIES

The RI was planned to determine the nature and extent of contamination at the ACS NPL Site in the media of soils, surface water, sediment, and groundwater. Field Investigations were conducted in two phases. The general goal of Phase I was to identify the contaminated areas and media; the general goal of Phase II was to determine the extent and character of the contamination in the areas and media identified as contaminated. The same basic investigative methodologies were used during both phases of the investigation. The methods included: geophysical survey; installation of monitoring wells; construction of staff gages piezometers; performance auger probes and soil borings; the excavation of test pits; the collection of groundwater, surface water and sediment samples; and the performance of aquifer tests.

All the sampling and activities were conducted in accordance with the approved Quality Assurance Project Plan and Addenda. The remainder of this section provides the technical details of the field procedures used during both phases of the investigation.

2.1 Geophysical Methods

Grid Layout

Two grids were established for conducting geophysical surveys; one in the Off-Site Containment Area, and the other in the On-Site Containment Area. Each grid was monumented with marked flags on a 45-foot grid spacing. Gridded areas for geophysical surveys are shown on Figures 2-1 and 2-2.

At the Off-Site Containment Area grid, wooden stakes were set at twelve grid locations to provide more permanent benchmarks in case it became necessary to re-establish the grid. The general procedure followed when conducting the surveys was to traverse the area, collecting readings on the instrument each 15 feet. Traverse lines were spaced 15 feet apart, guided by the flagged lines.

Magnetometer Survey

A vertical magnetic gradient survey was conducted at the Off-Site Containment Area. An EDA Omni IV Tie-Line Magnetometer with gradiometer was used to obtain the data. The gradiometer sensor was considered most appropriate because: it is insensitive to fluctuations in the earth's magnetic field, it has a wide operation range, permitting the instrument's use in the earth's magnetic field, and its wide operation range permits the instrument to be used in areas containing high amounts of ferrous metal which could preclude the use of a total field instrument.

The gradiometer instrument consisted of two total magnetic field sensors separated by 0.5 m, mounted on a vertical staff. The sensors recorded total magnetic field readings simultaneously and the gradient was calculated as a function of the sensor separation distance. The readings and station locations were stored in a data logger which was downloaded to a field computer daily.

The vertical gradient measurements were obtained on a 15 foot grid resulting in a total of 1,050 stations. Duplicate readings were recorded at approximately 75 stations for quality control purposes. The data is tabulated in Appendix C.

EM Surveys

Electromagnetic (EM) terrain conductivity surveys were conducted at the On-site and Off-site Containment Areas. The EM surveys were conducted by Fromm Applied Technology of Mequon, Wisconsin. The readings were obtained with an EM31D instrument with an attached data logger. The instrument was operated in the quadrature phase mode which provided direct terrain conductivity readings in millimhos per meter. The conductivity readings were obtained on 15-foot intervals at both areas. The data is tabulated in Appendix C.

In addition, the Still Bottoms Area was traversed with the EM instrument in the in-phase (metal detection) mode in order to verify the approximate dimensions of the disposal area.

2.2 Monitoring Device Installation

2.2.1 Upper Aquifer Monitoring Wells

Upper aquifer monitoring wells were constructed at six locations during Phase I. An additional 8 upper aquifer monitoring wells were installed during Phase II (Figure 2-3). The well borings were drilled using 4-1/4-inch ID hollow stem augers, and generally extended to the clay confining layer underlying the upper aquifer. Split spoon samples were collected at 2-1/2-foot intervals (ASTM D1586-84). Each split spoon sample was screened for volatile organic vapors using an HNu (11.7 eV lamp) and field classified by the supervising geologist. Boring logs for each monitoring well location are contained in Appendix D. Construction details are contained in Appendix E. Well completion details are summarized in Table 2-1.

Three samples of unconsolidated material were collected at each Phase I monitoring well for physical analyses in the Warzyn Geotechnical Laboratory. At each location, one split spoon sample was collected in the vadose zone, one split spoon sample was collected in the screened zone of the aquifer, and one sample was collected by Shelby tube (ASTM D1587) from the top of the clay confining layer beneath the upper aquifer. Shelby tube samples were collected by pushing the tube into the clay approximately 24 inches (or until refusal). The tube was left to stand for approximately 10 minutes to allow the clay to adhere to the inside of the tube.

Split spoon samples were submitted to the laboratory for grain-size analysis and Atterberg limits testing. The Shelby tube samples were submitted for laboratory permeability tests. The split spoon samples were collected in jars and chilled for transportation to the laboratory. Shelby tube samples were capped and sealed on both ends with hot wax prior to shipment. Results of geotechnical analysis for grain size and laboratory permeability are contained in Appendix F, and summarized in Table 2-2. Aquifer samples exhibited no plastic qualities, so Atterberg limits could not be assessed.

Upon completion of the borings, stainless steel (304) monitoring wells were installed with ten-foot, 0.01 inch slot, stainless steel screens located to intersect the water table. The casing and well screen were assembled and lowered to the pre-determined depth through the hollow stem auger. No. 30 flint sand was poured down around the well, inside of the augers as they were pulled up incrementally to assure a solid and uniform sand pack around the screen. A 1 1/2 to 2 1/2 foot bentonite seal was placed approximately 2 feet above the screen in the same manner. The remainder was filled with a cement-bentonite grout using a hose to tremie it down to the bentonite seal from the surface. A locking protective casing was then set into the cement, covering the well. Each well was marked with its respective number.

The split spoon samplers were decontaminated between each sample with a TSP wash and a potable water rinse. The drilling equipment and tools were steam cleaned before each well boring. The screens and riser were also steam cleaned and wrapped in plastic until installed.

2.2.2 Lower Aquifer Monitoring Wells

Four lower aquifer monitoring wells were installed during Phase II of the RI. Locations of these wells are illustrated in Figure 2-3. Boring logs and construction details for the wells are included in Appendices D and E.

The borings for the lower aquifer monitoring wells were advanced in the following manner. Each boring was drilled to the top of the clay confining layer with 4 1/4-inch I.D. hollow stem augers. Sampling of the boring was performed on 2 1/2 foot intervals to the top of the clay confining layer. After the confining layer was encountered, each boring was redrilled with 8 1/4-inch I.D. hollow stem augers equipped with a bottom wood plug. A 6-inch diameter permanent steel casing was placed in the boring and pounded approximately 1 foot into the clay layer. The annulus around the casing was tremie-grouted with cement-bentonite slurry, and the lower 3 feet of the casing were filled with the grout mixture. The grout was allowed to set up for at least 48 hours before additional drilling activities commenced.

After the grout had set up, the borings were advanced through the clay and into the lower aquifer using the rotary wash technique with a 4 7/8-inch diameter tri-cone roller bit. Both units were sampled continuously with a split spoon sampling device, and 5-inch diameter, threaded temporary casing was advanced as drilling progressed.

At a depth of approximately 10 feet below the top of the lower aquifer, each lower aquifer monitoring well was installed. Each well consists of 2-inch diameter, threaded, 304 stainless steel casing and 2-inch diameter, 0.010-inch slot, 304 stainless steel screen. Each screen is five feet in length. The casing and well screen were assembled and lowered to the pre-determined depth through the temporary casing. No. 30 flint sand was poured down around the well, inside of the temporary casing as it was pulled up incrementally to assure a solid and uniform sand pack around the screen. A bentonite seal at least 2 feet in thickness was placed approximately 2 feet above the screen in the same manner. The remainder was filled with a cement-bentonite grout using a hose to tremie it down to the bentonite seal from the surface. A locking protective casing was then set into the cement, covering the well. Each well was marked with its respective number.

2.2.3 Piezometers

During Phase I, 41 piezometers were installed (Figure 2-3). Piezometer installation was accomplished in the following manner. The piezometer borings were drilled using 3-1/4-inch ID hollow stem augers. The holes were visually logged by the cuttings as they were brought up by the augers. The piezometer casings, screens and caps are constructed of 1 1/2 inch ID, threaded, flush-joint PVC. The screens are five feet in length with 0.01 inch slots. The piezometers were assembled and lowered into the augers and set with the upper portion of the screen intersecting the water table. The augers were then removed, leaving the piezometer in place and allowing natural cave-in to occur around the screen. The annular space around the casing was then backfilled with cuttings to 2 feet below surface and the remainder filled with granular bentonite. Construction details for each piezometer are summarized in Table 2-1.

2.2.4 Leachate Monitoring Wells

The details of drilling and installation of the leachate wells were the same as those of the monitoring wells except there was no sampling of these boring locations and the casing and well screen were constructed of two-inch ID schedule 40 PVC materials. Boring logs are contained in Appendix D, and well construction details are summarized in Table 2-1.

2.2.5 Staff Gages

Ten staff gages were placed across the site to measure the surface water elevations (Figure 2-3). The staff gages consist of steel fence posts which were driven into the ground with a hammer. Elevations were shot to the top of the staff gages. Measurements were made from the top of the staff gage to the surface of the water.

Due to very soft ground conditions at some of the locations, a few of the staff gages had to be driven further down than originally planned. After the second round of water levels, several staff gages were completely submerged in the water due to heavy rains. Since the survey had not yet taken place, these staff gages were replaced with longer ones. The old staff gages were left in place and both were surveyed so that adjustments could be made to the readings taken at those locations during the first two rounds of water levels.

2.3 Soil and Waste Sampling Procedures

2.3.1 Soil Area Sampling (SA)

Soil Area (SA) sampling was conducted at three different areas on the ACS site. Two of the areas are located in the Off-Site Containment Area, and one is located within the ACS facility.

A Soil Area sample consisted of a composite sample of soil collected from an interval below the ground surface (approximate three feet) at five discrete locations within an area about 50 feet in diameter. A volatile organic compound (VOC) sample was collected, consisting of a grab sample selected from one of the five discrete sampling locations. The VOC sample was selected to represent the highest contamination based on visual observation and HNu readings. A drilling rig equipped with the three inch outer diameter (OD) split spoon and solid flight

augers was utilized for the soil area sampling. The boreholes created from the soil area samplings were backfilled with granular bentonite. The sampling equipment was decontaminated between each sampling location with a trisodium phosphate (TSP) wash, potable water rinse, and distilled water rinse.

2.3.2 Auger Probes (AP)

Review of historical data, aerial photographs and results of the geophysical survey provided a guide to waste burial areas. To optimize the selection of samples for contaminant assessment, an auger probe program was used to evaluate the vertical and horizontal extent of wastes in known burial areas, and to provide a preliminary indication of the types of waste buried. During the course of the RI, auger probes were performed at 83 locations. These auger probe locations are illustrated in Figures 2-1 and 2-2.

Auger probes were used for three purposes during the RI.

- In the Kapica/Pazmey area and the Off-Site Containment area, auger probes were used during Phase I to document the probable cause for 20 anomalies indicated during the geophysical survey. Auger probes were used during Phase II to further define waste burial areas located during Phase I.
- Geophysical surveys in the On-Site Containment Area indicated only one anomaly area. Therefore, auger probes were made in a 3 by 5 foot grid pattern across the area to provide a visual and HNu screening of the subsurface conditions.
- Above ground metallic tanks limited the utility of geophysics in the vicinity of the Still Bottoms Area and the Treatment Lagoon Area. Therefore, auger probes were used to delineate the extent of buried waste in these areas.

The general auger probe procedure consisted of advancing four-inch outer diameter solid flight augers to a predetermined depth with a drill rig, followed by pulling the augers up with minimal additional rotation. The material adhering to the augers was then examined visually and screened for organic vapors with an HNu to determine general thickness and character of the subsurface. The field observations and HNu readings for each of the auger probes are summarized in Appendix G.

2.3.3 Soil Borings (SB)

Seventy-three soil borings were drilled and sampled during the course of the RI. Locations of these borings are illustrated in Figures 2-1 and 2-2. Boring logs are contained in Appendix D.

Soil borings were generally advanced with 4 1/4 inch I.D. hollow stem augers. The soil borings were sampled with a split spoon (ASTM D1586-84) at 2 1/2-foot intervals from the surface to the base of each borehole. The samples were visually classified and screened for volatile organic compound vapors (VOCs) using an HNu with an 11.7 eV probe. If waste was encountered, sampling continued to a depth of at least 1 1/2 feet below the waste.

Samples collected for laboratory analysis were placed in the appropriate sampling containers for shipment to the laboratory for analysis. Quality Assurance Sampling, Chain-of-Custody protocols, sample handling, storing, and shipment, were conducted as specified in the Quality Assurance Project Plan (QAPP).

The split spoons were decontaminated between each sample with a TSP wash followed by a potable water rinse and distilled water rinse. Upon completion, each borehole was backfilled with bentonite grout or Holeplug to the surface.

2.3.4 Test Pit Excavations (TP)

The RI Work Plan specified the excavation of test pits in three areas suspected to contain waste buried in drums, including the On-Site Containment Areas, the Still Bottoms Area, the filled Treatment Lagoon #1, and the Off-Site Containment Area (Figures 2-1 and 2-2). The original plan was to collect two samples at each test pit location. One sample at each location would be representative of the buried waste material, and the second would be collected deeper from the apparently natural soil beneath the buried waste.

Several modifications were made to the Work-Plan-specified procedure after consultation with the U.S. EPA remedial project manager (RPM) and representatives from the U.S. EPA's technical oversight consultant, Roy F. Weston.

- An additional test pit (TP-1) was excavated in the Kapica/Pazmey Area (Figure 2-2) in an area in which soil borings could not be made because of large amounts of metallic debris.

- Undersoil samples were collected during excavation only at test pits TP-1 and TP-2. At locations TP-3 through TP-7, the soil materials were generally fine sand, which tended to cave-in to the water table in spite of attempts to excavate deeper. Since the waste was buried partially below the water table it was determined to be more practical to return later with a drill rig to collect the undersoil sample using hollow stem augers.

Test pits were excavated with a rubber tire mounted backhoe with a two-foot wide bucket, with one cubic yard capacity. The backhoe was used to dig a pit at each specified location to uncover buried waste or buried drums. Test pit logs were kept in the field. Copies are contained in Appendix H. Excavation and sampling operations were performed in Level B personal protective equipment.

Waste was composited from five separate areas within the bucket to constitute a waste sample. Each sample was placed in the appropriate sampling containers for shipment to the laboratory for analysis. Quality Assurance Sampling, Chain-of-Custody protocols, sample handling, storing, and shipment, were conducted as specified in the Quality Assurance Project Plan (QAPP).

After a representative sample was obtained, the excavation was backfilled with the material which had been removed during excavation, and smoothed flat with the backhoe bucket. Next, soil adhering to the backhoe was removed, and the machine was taken to the decontamination pad, where the bucket and backhoe arm were decontaminated by steam cleaning.

2.4 Surface Water/Sediment Sampling (SW/SD)

Surface water samples were collected at five locations during Phase I of the RI. Sampling locations are illustrated in Figure 2-4.

Each surface water sample was collected from the upper one foot of standing water, with care taken to avoid disturbing bottom sediments. A stainless steel sampling dipper was used to lift water from the water body and pour into the sampling bottles. Field measurements of temperature, pH, and specific conductance were made and recorded. Several proposed surface water sampling locations were not sampled, due to dry conditions.

After each sample was collected, the sample containers and equipment were transported back to the on-Site Warzyn field office. The samples were filtered or preserved, as stipulated, packed and transported under chain of custody as described in the Sampling and Analysis Plan. The sampling equipment was decontaminated by cleaning in a trisodium phosphate wash, followed by a potable water rinse, and a final rinse with distilled water. After decontamination, the equipment was sealed in plastic wrap for transportation to the next sampling location.

Sediment samples were collected at eleven locations during Phase I (Figure 2-4). At several of the locations, both surface water and sediment samples were collected. The sample designations for both media at these locations used corresponding numbers (i.e., SW-01 was collected at same location as SD-01).

Each sediment sample was collected using a stainless steel hand bucket auger. The auger was turned about six inches into the ground to remove sufficient sample volume. After each sample was collected, the sample containers and sampling equipment were transported back to the Warzyn field office. The samples were handled and transported under chain-of-custody protocols as described in the Sampling and Analysis Plan. The sampling equipment was decontaminated by cleaning in a trisodium phosphate rinse, followed by a potable water rinse, and a final rinse with distilled water. After decontamination, the equipment was sealed in plastic wrap for transportation to the next sampling location.

2.5 Aquifer Sampling

2.5.1 Aquifer Matrix Sampling (AM)

Aquifer matrix samples were collected for VOA and semivolatile compound analysis at five locations during Phase II. Sampling locations are illustrated in Figure 2-3.

Soil borings for aquifer matrix samples were advanced with 4 1/4-inch I.D. hollow stem augers. A sampling interval was chosen about midway through the thickness of the upper aquifer. The sampling interval was based on the results of the Tracer groundwater investigation, which suggested that this depth interval should exhibit the highest contaminant concentrations. A three-inch diameter split spoon was used to collect a saturated sand sample of the upper aquifer. Samples were placed in appropriate containers and shipped to the laboratory following required chain-of-custody protocols.

2.5.2 Confining Layer Sampling

At each Phase I upper aquifer monitoring well, a Shelby tube sample of the top of the clay confining layer was collected for determination of laboratory permeability. The Shelby tube sample was obtained by pushing the tube approximately 24 inches into the clay confining layer, or until refusal. Each tube remained in the boring for approximately 10 minutes, to allow the clay to adhere to the inside of the tube. Laboratory permeability results are summarized in Table 2-2.

Sampling of the confining layer for grain size, porosity, total organic carbon (TOC) and Atterberg limits was performed at MW-7 and MW-9 during the Phase II investigation. A Shelby tube sample was obtained of the clay midway into the confining layer at these locations, and submitted for analysis. The results of this testing are summarized in Table 2-2. Appendix F contains the raw laboratory data.

2.5.3 Baildown Tests

Field hydraulic conductivity testing in the form of baildown tests was performed at each upper aquifer and lower aquifer monitoring well installed during the RI. The basic concept behind these tests is that the rate of rise of the water level in a well after "instantaneous" removal of a volume of water is a function of aquifer hydraulic conductivity.

Hydraulic conductivity testing was performed at each upper aquifer well as follows:

- An initial measurement of static water level was made.
- A volume of water was then displaced as rapidly as possible using a stainless steel bailer.
- Water level changes in the well were sensed and recorded by a pressure transducer located below water level in the well and connected to an electronic data logger. Water level measurements were collected automatically on logarithmically increasing time steps, starting at 0.003 minutes.

Hydraulic conductivity testing was performed at each lower aquifer well using the following procedure:

- An initial measurement of static water level was made.
- Pressurization equipment, using breathing-quality air, was used to depress the water level within the well to the desired depth.
- The air supply was turned off to instantaneously release air pressure from the well.
- Water level changes in the well were sensed and recorded by a pressure transducer located below water level in the well and connected to an electronic data logger. Water level measurements were collected automatically on logarithmically increasing time steps, starting at 0.003 minutes.

The analysis of the test data made use of a computational method presented by H. Bouwer, and R. Rice, 1977, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells", Water Resources Research, Vol. 12, No.3, pp. 423-428. Analysis of the

Phase II upper aquifer monitoring wells, and the lower aquifer monitoring wells, was accomplished utilizing Geraghty Miller's "AQTESOLV" aquifer test analysis computer software. This program performs analysis of test data using the method of Bouwer and Rice.

Hydraulic conductivity testing results are summarized in Table 2-3. Data generated during the analysis of the hydraulic conductivity data is contained in Appendix I.

2.6 Groundwater Sampling

2.6.1 Tracer Investigation

During Phase II of the RI, a shallow groundwater investigation was performed by Tracer Research Corporation to assist in defining the limits of the plume in the upper aquifer at the ACS Site. During this investigation, 55 groundwater samples were analyzed from 38 sampling locations. Sampling locations are illustrated in Figure 2-5.

Samples were acquired for analysis in the following manner. Sampling probes consisting of 7 to 14-foot lengths of 3/4-inch diameter hollow steel pipe equipped with drive points were driven to the desired sampling depths. Once the required depth at each location had been achieved, the probe was withdrawn several inches to permit water inflow into the resulting hole. A length of 1/4-inch diameter polyethylene tubing was inserted through the sampling probe to the base of the hole. Water was drawn up through the polyethylene tube under a vacuum.

Groundwater samples were collected in 40-mL VOC vials that were filled approximately 3/4 full. Samples of the headspace in the VOC vials were obtained with a syringe, and then injected into a portable gas chromatograph for analysis. Compounds analyzed included benzene, toluene, ethylbenzene, xylenes, and total hydrocarbons. Figure 2-6 summarizes the results of the investigation. Appendix J contains the analytical data generated.

2.6.2 Field Parameter Testing

During Phase I and Phase II groundwater sampling, field parameter measurements of temperature, pH, and specific conductance were made at each well. In addition, field measurements of Oxidation/Reduction Potential (Redox) and Dissolved Oxygen content were made during Phase II, Round II sampling. Field parameters are summarized in Appendix K.

2.6.3 Monitoring Well Sampling (GW)

Two sampling rounds were performed at each of the Phase I and Phase II monitoring wells. The sampling procedure at each well included:

- measuring static water level with an electronic water level indicator or tape with attached "popper";
- purging well by bailing approximately three times the well volume;
- collecting appropriate volumes of groundwater, preserving, filtering (as necessary), handling and shipping to the analytical laboratory, in accordance with the protocols listed in the Sampling and Analysis Plan; and
- making field measurements of temperature, pH, and specific conductance.

Following purging, when water level had recovered, sample volumes were collected in the following order: (1) two 40-ml vials for volatile organic analysis, (2) four one-liter glass amber bottles for semi-volatile organic analysis, pesticides and PCBs, and (3) five one-liter polyethylene bottles for metals, cyanide, total organic carbon (TOC), nitrate-nitrite, ammonia, chemical oxygen demand (COD), chlorides, alkalinity, sulfate, total dissolved solids (TDS), and total suspended solids (TSS). One 250-ml polyethylene container was filled for field parameters. Preservatives were added to sample containers for metals, cyanide, TOC, nitrate-nitrite, ammonia, and COD within one hour of sample collection.

Quality Assurance Sampling, Chain-of-Custody protocols, sample handling, storing, and shipment, were conducted as specified in the Quality Assurance Project Plan (QAPP).

The sampling equipment (i.e., bailer and cable) were decontaminated before and after each sampling. The decontamination procedure for each equipment item was: a wash with trisodium phosphate (TSP) solution, a rinse with potable water, and a final rinse with distilled water. The decontaminated equipment was placed in clean plastic bags for transportation to the next sampling location.

Water level measurements were obtained on several occasions during the course of the RI, in addition to those obtained during routine groundwater sampling. These measurements are summarized in Table 2-4.

2.6.4 Leachate Sampling (LW)

Four (4) leachate water samples were collected from Griffith Municipal Landfill leachate wells LW-1 through LW-4. The samples were submitted for EPA Target Compound List (TCL) and Target Analyte (TAL) parameters. The sampling procedure at each leachate well included: measurement of static water/leachate elevation, removal of approximately three times the static volume of water/leachate, and field measurement of temperature, pH, and specific conductance. After the well had recharged from purging, sample volumes were collected in the following order: (1) two 40-ml vials for volatile organic compounds (VOCs); (2) four one-liter glass amber bottles for semi-volatiles, pesticides and PCB analysis; and (3) five, one-liter polyethylene bottles for metals, cyanide, total organic carbon (TOC), nitrate-nitrite, ammonia, chemical oxygen demand (COD), chlorides, alkalinity, sulfate, total dissolved solids (TDS), and total suspended solids (TSS). One 250-ml polyethylene container was filled for field parameters. Preservatives were added to the metal, cyanide, TOC, nitrate-nitrite, ammonia, and COD within one hour of sample collection.

The sampling equipment (i.e., bailer and cable) were decontaminated before and after each sampling. The decontamination procedure for each equipment item was: a wash with trisodium phosphate (TSP) solution, a rinse with potable water, and a final rinse with distilled water. The decontaminated equipment was placed in clean plastic bags for transportation to the next sampling station.

Quality Assurance Sampling, Chain-of-Custody protocols, sample handling, storing, and shipment, were conducted as specified in the Quality Assurance Project Plan (QAPP).

2.6.5 Private Well Sampling (PW)

Private well sampling was performed at eight locations during Phase II of the RI. Residences where private well samples were obtained are illustrated in Figure 2-7. Available well logs are contained in Appendix L. Private wells identified within the Site vicinity are presented in Table 2-5.

At each private well location, a sampling location was chosen where well water did not undergo any treatment or softening. The water was allowed to run for approximately 15 minutes, and field measurements of temperature, pH, and specific conductivity were obtained at five-minute intervals. A calculation of purge volume was made at each sampling location, by determining the rate of flow into a five-gallon pail.

Samples were collected in the same parameter sequence as followed for monitoring well samples. Preservatives were added as required. Private well samples were not filtered.

Quality Assurance Sampling, Chain-of-Custody protocols, sample handling, storing, and shipment, were conducted as specified in the Quality Assurance Project Plan (QAPP).

SECTION 3
FIELD OBSERVATIONS

3.1 INTRODUCTION

The Remedial Investigation was conducted in two phases. The purpose of Phase I was to evaluate the groundwater flow and character of potential contamination in the upper aquifer, and characterize the sources of buried waste at the ACS NPL Site. The purpose of Phase II was to complete delineation of any upper aquifer contamination, and to delineate the vertical and horizontal extent of buried waste in the areas identified during the Phase I investigation.

A full understanding of the site characteristics and contamination results from an evaluation of all the sampling results from both Phase I and II. That evaluation is provided in Sections 4, 5, and 6 of this report. The purpose of this section is to provide a narrative description of the RI, and how it progressed from Phase I through Phase II. As a result, the section describes Phase I sampling results, and does not focus on the Phase II findings. This section should not be taken as an evaluation of the site conditions, but as a description of the conceptual approach to investigating the Site, and a summary of the rationale for the sampling which was conducted.

The Work Plan provided for the collection of 48 soil and waste samples to characterize the sources of contamination in Phase I, and the collection of an additional 20 samples in Phase II to complete the delineation of identified contamination. On the basis of the Phase I results, it was evident that 20 additional samples in Phase II would be insufficient to adequately characterize the full extent of contamination at the Site. The PRPs and Warzyn worked with the U.S. EPA RPM to develop a Supplemental Technical Investigation (STI) to supplement the Work Plan with an adequate number of appropriate samples. The supplemented Work Plan replaced the 20 full TCL/TAL Phase II samples with 109 samples collected from multiple depths at 59 locations.

The field work was conducted in 5 general areas: the landfill, surficial soil areas, buried waste, and groundwater. The remainder of this section of the RI Report presents the field observations from both Phases of the RI, with a focus on the rational for selecting Phase II sampling locations and parameters.

3.2 LANDFILL INVESTIGATION

The focus of the investigation in the Griffith Municipal Landfill Area was the inactive portion to the south and east (Figure 1-2). The investigation of the landfill included placement and sampling of four leachate head wells (LW-1 through LW-4) during Phase I. On the basis of the Phase I results, no additional investigation was necessary for Phase II.

Additional analytical data was collected from monitoring wells MW-1 and MW-15 located on the south boundary of the landfill. Water level data was collected at several piezometers and staff gages placed in and around the landfill.

3.3 SURFICIAL SAMPLING

Sampling of surficial soil, sediments and waters were conducted in both phases of the investigation. The sample groupings include soil area (SA) samples and surface water/sediment (SW, SD and SD/SW) sampling. Soil area samples were collect within the ACS facility at the site of the former incinerator and at the Kapica drum recycling area. Surface water and sediment samples were collected in the Fire Pond within the ACS facility, in the ditch west of the Off-Site Containment Area, and in the wetlands on the downgradient sides of the Site.

3.3.1 Former Incinerator Area

During Phase I, one soil area sample (SA-3) was collected in the former incinerator area. The sample consisted of surficial soil material, collected from a depth of 6 to 18 inches and composited from five discrete areas into a single sample. The sample was analyzed for full TCL and TAL parameters. Phase I results indicated that additional sampling would not be necessary.

3.3.2 Kapica Drum Recycling Area

3.3.2.1 Phase I Investigation. In the Phase I investigation, two soil area samples were collect at the Kapica/Pazmey area (SA-1 and SA-2). Locations are shown on Figure 2-2. The samples were composite samples from 6 to 18 inch depths at five discrete locations across an approximately 50 by 100 foot area. Sample SA-1 was located northwest of the Kapica building and SA-2 was located north of the building.

In both soil areas, the surface and near surface soils consisted of brown and gray sandy fill with various metal debris including drum lids and parts. Traces of colored organic material and sludge were noted throughout the area. Solvent-like odors were detected and elevated HNu readings were recorded on the boring logs (Appendix D). Samples were analyzed for full TCL and TAL parameters and found to contain PCB contamination.

3.3.2.2 Phase II Investigation. To fully document the distribution of PCBs in the surficial soils further PCB sampling was conducted in Phase II. The sampling consisted of making a grid of 12 shallow borings (SB-43 through SB-54) and collecting samples at two discrete depths, 0-1 foot and 3-4.5 feet. The sampling locations were layed-out across the Kapica Area in a regular grid with approximately 50-foot spacing.

3.3.3 Surface Water Drainage Areas

3.3.3.1 Phase I Investigation. The approved work plan designated 11 locations for collecting both surface water and sediment samples. During the pre-investigation Site meeting between the U.S. EPA and Warzyn, several of the locations allocated in the approved work plan were modified, and several of the locations were designated as sediment-only sampling locations. Changes in locations were appropriate because site operations, particularly in the landfill vicinity, have changed to different areas. In addition, some of the locations appropriate for sediment sampling did not contain standing water, so the surface water sample was eliminated for these locations.

Phase I sampling locations were designated as SD01 through SD09 and SW01 through SW08. These include: two water and sediment locations on the ACS facility (SD/SW01 and SD/SW02); two sediment locations in the marsh west of the ACS facility along a surface water run-off route (SD03 and SD04); one surface water and sediment location in the drainage ditch just west of the Off-Site Containment Area (SD/SW05); one sediment locations in the marshy area south of the landfill (SD06); three locations along the drainage ditch in the west marsh (SD/SW07A and SD07B) and between ACS and the landfill (SD07C); and two locations in the marshy areas east of the landfill (SD/SW08 and SD09). The samples were analyzed for full TCL and TAL parameters.

3.3.3.2 Phase II Investigation. Phase I sampling indicated low levels of PCBs in samples located along surface water drainage routes between ACS and the landfill. Six additional sediment samples were collected in Phase II (SD10-SD15) and analyzed for full TCL and TAL parameters. These areas are locations where groundwater discharges to the surface to form surface water run-off. The purpose of the sampling was to identify any contamination resulting from the discharge of contaminated groundwater.

3.4 BURIED WASTE INVESTIGATION

3.4.1 On-Site Containment Area

The On-Site Containment Area was identified and named by the U.S. EPA FIT team in 1985. It is a rectangular area approximately 250 feet north to south and 450 feet west to east, located in the northern third of the fenced ACS facility (Figure 1-2).

U.S. EPA reports indicated that the area was used to store drums of waste materials prior to 1975. An aerial photograph of the Site from 1970 (Appendix A) shows rows of ground cover in this area which it is reasonable to assume are drums. An aerial photograph from 1973 (Appendix A) indicates that the area is clear with no sign of drums on the ground surface. At the present time, the area is flat with no vegetation, no surface construction, and little debris. Coarse sand and gravel covers the entire area.

The field investigation for the On-Site Containment Area was conducted in two phases. The purpose of the first phase was to identify any potential contaminant sources in the area; the purpose of the second phase was to document the horizontal and vertical extent of the contamination, and to identify the concentrations of the contaminants present. Investigative procedures included the following:

Phase I

- Aerial photograph review
- A geophysics investigation
- 15 auger probes
- 1 test pit excavation
- 6 soil borings to collect soil samples at two depths
- Analysis of 12 soil samples for TCL/TAL parameters
- Surveying horizontal and vertical locations of auger probes, test pit and soil borings.

Phase II

- 6 additional soil borings to collect soil samples at three depths.
- Analysis of 18 soil samples for TCL volatile organic compounds.
- Surveying horizontal and vertical locations of soil borings.

3.4.1.1 Phase I Investigation.

Aerial Photographs Review

Aerial photographs of the Site vicinity from 1954, 1958, 1965, 1970, 1973, and 1980 were evaluated. These indicate that numerous drums were stored on the On-Site Containment Area from 1968 until after 1970. The evidence of drums is gone in an aerial photograph dated 1975 (Appendix A).

Geophysical Investigation

Prior to initiating intrusive investigation methods, a geophysical survey was conducted across the On-Site Containment Area, using an Electromagnetic (EM) terrain conductivity instrument. Instrument readings were taken at each intersection of a 15-foot grid over the 250 by 450 foot On-Site Containment Area. The raw data and contour plots are contained in Appendix O.

The EM survey indicated one major resistivity anomaly and several small anomalies. The large anomaly was further investigated by making a test pit excavation. The others were investigated by auger probe.

Phase I Auger Probes

Since there was only large one geophysical anomaly, auger probes were used to identify the appropriate points to select locations for six sampling borings. A detailed description of the investigative method is included in Section 2 of this report.

Fifteen auger probes (AP-21 through AP-35) were made in a grid with approximately 100 foot spacing. The locations of several auger probes were modified from exact grid coordinates to investigate the minor geophysics anomaly areas. (A detailed description of the investigation methodology is included in Section 2 of this report.) The on-site geologist kept a written log of the observations and HNu readings for each auger probe. The observations are summarized in Appendix G.

Phase I Soil Borings

In accordance with the approved Work Plan, soil borings were made at six locations for the purpose of collecting samples for analysis from two separate depths. (A detailed description of the investigation methodology is included in Section 2 of this report.) Soil borings SB-08 through SB-13 were collected in the On-Site Containment Area during Phase I of the investigation. The six locations were selected on the basis of the geophysical survey and auger probe findings and approved by U.S. EPA RPM.

The general procedure at each location was to drill with hollow stem auger, collecting split-spoon samples at 2.5-foot intervals. One soil sample was collected for laboratory analysis from two discrete depths in each borehole. The sampling intervals were selected (on the basis of visible evidence of contamination and HNu VOC readings) to represent the most highly contaminated zones in the boring. Each sample was analyzed for full TCL and TAL parameters.

Based on the EM survey and auger probe findings, specific soil boring locations were selected for subsurface soil sampling and analysis. Rationale for the selected soil boring locations are as follows:

SB-08 was drilled near auger probe AP-22 to identify the nature of elevated HNu readings and a petroleum-like odor in the underlying soils. Sample SB08-6′ and SB08-10′ were submitted for analysis.

SB09A was drilled near auger probe AP-34 to identify the nature of elevated HNu readings in the underlying near surface soils. However, while drilling SB09A, conditions encountered in the subsurface soils high HNu readings were not detected. Therefore, this boring locations was abandoned and relocated further east toward AP-33. No samples from SB09A were submitted for analysis.

SB09 and
SB10 were drilled and sampled near auger probe AP-33 to identify the perimeter conditions of a mounded area in which drums are reported to be buried. AP-33 was drilled into the mounded area and did encounter several drum carcasses and/or lids. The HNu readings recorded were the most elevated in the On-Site Containment Area. Samples SB09-6′, SB09-10′, SB10-5′ and SB10-10′ were submitted for analysis.

SB11 was drilled and sampled near auger probe AP-24 to identify the nature of elevated HNu readings in the underlying soils. Samples SB11-5′ and SB11-10′ were submitted for analysis.

SB-12 was drilled and sampled near auger probe AP-28 to identify the nature of elevated HNu reading and possible staining in the underlying soils. Samples SB12-5′ and SB12-10′ were submitted for analysis.

SB-13 was drilled and sampled near auger probe AP-26 to identify the nature of elevated HNu readings and a napthalene-like odor in the underlying soils. Samples SB13-5′ and SB13-10′ were submitted for analysis.

At each of these soil boring locations, the subsurface soils were sampled at 2.5-foot intervals to the end of the boring. Soil samples were collected for analytical purposes from the most contaminated interval based on visual observations and HNu readings. Each boring was extended beyond the visibly contaminated zone in order to collect an undersoil sample. Thus, two subsurface soil samples were collected from each soil boring for analytical purposes.

A test pit, TP-2, was excavated in the area with the large geophysics anomaly. This area is mounded slightly above the flat ground surface is characteristic of most of the ACS facility. The drums appear to be buried on their sides and closely packed together. Various liquids were observed in soil surrounding the drums, such as brownish water, an oil-like liquid, and a viscous blue liquid leaking from several drums. The majority of drums were noted to be dented, corroded and/or mangled. Native soil was encountered at about 5 feet below the surface beneath the buried drums.

Two samples were collected from the test pit and submitted for laboratory analysis of TCL and TAL parameters. TP-2 was collected to represent the waste materials leaking from several of the drums and saturating the soil surrounding the drums. SB-10 was collected from the natural soil which underlies the drums and contaminated soils.

The laboratory test results are described and evaluated in Section 5.4 of this report.

3.4.1.2 Phase II Investigation. Phase I field observations and analytical results indicate that two discrete areas of contamination exist in the On-Site Containment Area. The East Area consists of most of the area and is characterized by relatively high levels of volatile organic contamination at and below the water table. The West Area is the major geophysical anomaly area which was found to contain buried drums.

Phase I analytical results indicated:

East Area	A majority of the Phase I samples indicated VOC contamination in the zone at and below the water table.
West Area	Both samples collected from the buried drum zone contained VOCs, PAHs, and PCBs.

The purpose of the Phase II sampling in the East Area was to document the vertical and horizontal extent of VOC contamination in the subsurface. Sampling consisted of making 6 additional soil borings, which, together with Phase I sampling, make a 3 by 3 (9 point) sampling grid. The Phase II soil borings included SB55 through SB60; locations are shown on Figure 2-1. Phase II samples were collected at two depths and laboratory analyzed for VOCs according to the following rationale:

7 feet	Approximately at the water table
16 feet	At the base of the upper aquifer

The purpose of Phase II sampling in West Area was to document the vertical and horizontal extent of subsurface contamination and to differentiate, to the degree possible, between the extent of VOC contamination and the extent of PCB/PAH contamination. Phase II sampling included eight additional soil borings (SB61 through SB68). Locations are shown on Figure 2-1). Phase II samples were collected at two depths and laboratory analyzed for VOCs and PCBs, according to the following rationale:

7 feet	Approximately at the water table
16 feet	At the base of the upper aquifer

The results of Phase II laboratory tests are described and evaluated in Section 5.3 of this report.

3.4.2 Still Bottoms Area

The Still-Bottoms Area was identified and named by the aerial photographs. It is an oval area approximately 100 feet in diameter in the central portion of the fenced ACS facility (Figure 1-2). The east and west flank of the Still-Bottoms Area have been covered by the construction of aboveground holding tanks.

Reports indicate that the Still Bottoms Area was a bermed, aboveground lagoon used to temporarily store still-bottoms material prior to off-site disposal. The lagoon was reportedly closed during 1975. The closure consisted of filling the bermed area with solid materials and covering it with crushed rock.

The field investigation of the Still-Bottoms Area was conducted in two phases. The purpose of the first phase was to identify any potential contaminant sources below ground in the area; the purpose of the second phase was to document the horizontal and vertical extent of the contamination, and to further delineate the concentrations of the contaminants present. Investigative procedures included the following:

Phase I

- Aerial photograph review
- Two auger probes
- Two test pits
- Two soil borings to collect soil samples from below buried waste
- Analysis of four soil samples for TCL/TAL parameters
- Surveying horizontal and vertical location of auger probes, test pit and soil borings

Phase II

- Two additional soil borings to collect soil samples at one depth
- Four additional soil borings to collect soil samples at two depths each
- Surveying horizontal and vertical locations of soil borings

3.4.2.1 Phase I Investigation. Aerial photographs of the Site vicinity from 1954, 1958, 1965, 1970, 1973 and 1980 (Appendix A contains copies of sections from the 1954, 1958, 1970, 1973, and 1981 photographs). These provided a preliminary indication of the location and horizontal extent of the bermed area. The area was further delineated with auger probes during the investigation.

As specified by the RI Work Plan, two test pits (TP-6 and TP-7) were excavated into the former Still-Bottoms Area. The area is slightly mounded above the flat surface between vertical aboveground storage tanks of the active ACS facility. Test pit TP-6 was excavated near the south end and TP-7 was excavated about 150 feet further north. Test pit logs are contained in Appendix H.

Buried drums were encountered in both TP-6 and TP-7 below about 3 feet of silty sandy fill. In TP-6, a blue liquid and various colored gels and solids were found in the sandy fill surrounding the buried drums. This material was collected for a waste sample (TP-6-4). The pit was excavated deeper to obtain the undersoil native soils sample and submitted for laboratory analysis of TCL and TAL parameters. Because of concern that further excavation might cause downward migration of the waste, a field decision was made to abandon the efforts of obtaining the native undersoil by excavation and to collect the undersoil at this location by soil boring.

The soils encountered at TP-7 contained an opaque solid jelly-like substance which was leaking from a corroded and dented drum. This material was sampled (TP-7-3) along with some of the surrounding stained sandy fill and submitted for TCL and TAL parameter analysis. After sampling, the test pit was backfilled with the removed material. The native undersoil sample at this location was also collected by soil boring.

Two soil borings with sampling and two auger probes were added during Phase I investigation activities. The two soil borings, SB-17 and SB-18, were drilled at test pit locations TP-6 and TP-7, respectively, to collect a sample of the soil from beneath the buried waste which had been encountered in the test pits. A soil sample was collected from each soil boring and submitted for laboratory analysis of TCL and TAL parameters. SB17-6.5′ and SB18-7′ were collected at those depths to represent the underlying native soil conditions below the buried drums identified during test pit excavations. Two auger probes, AP-40 and AP-41, were drilled to identify the northern boundary of the Still-Bottoms Area. The laboratory test results are described and evaluated in Section 5.4 of this report. Visual observations and HNu readings were recorded at each auger probe and compiled in Appendix G.

3.4.2.2 Phase II Investigation. Phase I field observations and analytical results indicated that there is a discrete area of contamination existing in the Still-Bottoms Area. Samples from the two areas collected by test pit and soil borings indicated high levels of VOCs and PAHs at both locations, and concentrations of PCBs just below generic cleanup standards at one of the locations. Phase I sampling did not identify the lateral extent to the east and north.

The purpose of the Phase II sampling was to define the horizontal extent of VOC, semi-volatile and PCB contamination to the east and north and to provide additional data to evaluate potential PCB concentrations. Sampling consisted of performing six additional soil borings (SB-22, SB-23, SB-69, SB-70, SB-71 and SB-72). Results are discussed in Section 5.4. The Phase I soil boring samples (SB-22 and SB-23) were collected at one depth and analyzed for VOCs, semi-volatiles and PCBs. The depth of 12 feet below the ground surface was selected to represent the underlying native soil conditions (approximately 5 feet below the water table). Soil boring SB-22 was located midway between test pits TP-6 and TP-7, and SB-23 was located approximately 50 feet east-southeast of SB17.

The Phase II soil boring samples from SB-69, SB-70, SB-71, and SB-72 were collected at two depths and analyzed for VOCs, semi-volatiles and PCBs. The two sampling depths are 8 (approximately at the watertable) and 20.5 feet (at the base of the upper aquifer). These four borings locations were selected in accessible areas near the perimeter in the former Still-Bottoms Area. These locations represent the probable extent of contamination condition surrounding the buried drums of the Still-Bottoms Area.

3.4.3 Treatment Lagoon Area

The Treatment Lagoon Area was identified by the EPA FIT team and also by the aerial photographs. It is an oval area approximately 200 feet by 100 feet immediately east of existing fire pond within the active ACS facility (Both ponds are evident in the 1970 aerial photograph, Appendix A). The eastern boundary of the Treatment Lagoon Area is flanked by above-ground storage tanks near the Still-Bottoms Area.

Reports indicate the Treatment Lagoon was closed soon after the Still-Bottoms Area was filled. The closure reportedly consisted of filling the lagoon with solid material and covering it with crushed gravel. The area is currently a parking lot with a surface elevation 3 to 5 feet above the surrounding ground level.

The field investigation of the Treatment Lagoon Area was conducted in two phases. The purpose of the first phase was to document the characteristics of the buried contaminants. The purpose of the second phase was to define the horizontal and vertical extent of the contamination and to identify the concentrations of the contaminants present.

3.4.3.1 Phase I Investigation. Aerial photographs of the Site vicinity indicate that the existing fire pond was excavated west of the Treatment Lagoon in 1972, and that the Lagoon was filled in by 1973.

Prior to initiating intrusive investigation methods, a geophysical survey was conducted across the Treatment Lagoon Area, using an electromagnetic (EM) terrain conductivity instrument. The raw data and contour plots are contained in Appendix C.

As specified in the Work Plan, three test pits (TP3, TP4, and TP5) were excavated into the filled lagoon area. The test pits are arrayed south to north above the axis of the oval lagoon area.

Test pit TP-3 was excavated to a depth of about 9 feet. The subsurface soils consisted of approximately 8 feet of brown and black sand fill above the watertable. Staining and elevated HNu readings were detected at 7 to 8 feet. A drum was encountered buried at a depth of 9 feet and a viscous brown liquid accumulated in the bottom of the pit. A waste sample (TP-3-9 feet) was collected of the oil-saturated sand surrounding the drum. Attempts were made to continue the excavation deeper to collect the native undersoil sample, but the walls of the pit continually sloughed in. A field decision was made to abandon the attempt to dig below the waste and consider this location for a sample collected by a soil boring, later designated as SB-14.

The subsurface material at TP-4 was similar to that discovered at TP-3. A single drum was encountered about 8 feet below the surface and a thin brown liquid accumulated in the bottom of the pit. A saturated sand sample (TP-4-8') was collected to represent the waste sample and the pit was backfilled with the material which had been excavated. Soil sample SB-15 was later collected by auger to represent the undersoil at this location.

Test pit TP-5 was excavated at the northern end of the lagoon area. Many drums were observed buried about 2 feet below ground surface at TP-5. Similar thin brown liquid wastes accumulated in the bottom of the pit and were collected along with the sandy matrix for a waste sample (TP-5-3 feet). After sampling, the test pit was backfilled with the removed material.

During Phase I, seven auger probes (AP-36, AP-37, AP-38, AP-39, AP-42, AP-43 and AP-44) were drilled near the perimeter of the Treatment Lagoon to define the extent of the buried material within the Treatment Lagoon Area. The auger probes were drilled in areas near the estimated perimeter of the Treatment Lagoon which were also accessible to a drill rig. Visual observations and HNu readings were recorded at the probe location.

3.4.3.2 Phase II Investigation. The horizontal extent was determined in Phase I from the aerial photograph and auger probes. The Phase I sample analyses from TP-3, TP-4, and TP-5 indicated high levels of VOCs and PAHs in all three test pits and two of the three deeper soil borings. PCBs were not detected in any of the samples. The horizontal extent of the lagoon as indicated in the aerial photographs was confirmed by the Phase I findings, but vertical extent remained uncertain.

The purpose of Phase II sampling was to delineate the vertical extent of contaminated soils. Phase II sampling consisted of making four additional soil borings (SB-21, SB-73, SB-74 and SB-75). Soil boring sample SB-21 was collected at two depths and analyzed for VOCs, PCBs and PAHs. This boring was located near the northeastern most perimeter of the Treatment Lagoon Area. The sample depth of 7 feet was selected to represent water table conditions and the 12 foot sample depth was selected to represent conditions 5 feet into the upper aquifer. The remaining three soil borings SB73, SB74 and SB75 were drilled near the Phase I test pits TP3, TP4 and TP5, respectively. Soil borings, sample depths and rationale are as follows:

- SB73 (5 feet) and SB75 (5 feet) to represent condition of fill material above the water table.

- SB73 (19 feet) and SB74 (19 feet) to represent condition of underlying native soil at the base of the upper aquifer.

- SB74 (15 feet) to represent the condition of underlying soil several feet below the buried material.

Phase II soil boring samples were analyzed for VOCs and semi-volatiles. The results of the Phase II laboratory tests are described and evaluated in Section 5.4.2 of this report.

3.4.4 Fire Pond Area

3.4.4.1 The Fire Pond. The Fire Pond was identified by aerial photographs and named by American Chemical Services (ACS) facility staff. It is an existing body of water that occupies an area 200 feet by 60 feet within the active ACS facility. The pond collects surface water runoff from the plant's storm sewer system.

The field investigation for the Fire Pond area was conducted during Phase I to identify any potential contaminant source in the pond itself. Sampling consisted of collecting surface water sample SW01 and sediment sample SD01. The results (Appendix Q-3) did not indicate contamination which would require further delineation in Phase II.

3.4.4.2 Area West of the Fire Pond. No Phase I field work or sampling was conducted in the area west of the existing Fire Pond. However, in Phase I during the construction of piezometer P-37 in that area, the auger cuttings were noted to contain traces of sludge-like product with elevated HNu readings. Later, when water level measurements were attempted in P-37, a brownish-red oily substance had accumulated in the piezometer.

It was thought that the liquid in the piezometer might indicate that a similar liquid was floating on the water table. Additional field work was proposed and conducted in the area west of the Fire Pond near Piezometer P-37 to determine the extent of soil and aquifer contamination in the area. Investigative procedures included the following:

- Nine auger probes
- One soil boring to collect a sample a waste material revealed in P-37
- Analysis of one sample for TCL/TAL parameters

The investigation was conducted by first making single, 10-foot deep auger probes 100 feet north, 100 feet west, and 100 feet south of P-38. When no waste was found floating on the water table at those locations, the distances were halved, and auger probes were made 50 feet in each of the three directions from P-38. These borings again showed no accumulation of floating waste, so the distance was halved again to 20 feet. The auger probe locations (AP-45 through AP-53) are shown on Figure 2-1.

No accumulation of floating waste was found at any of the nine auger probes (AP-45 through AP-53). However, the soil overlying the water table had an oily consistency, so a sample was collected of the soil at a depth of 7 feet, just above the water table (SB-20-7) and submitted for full TCL and TAL parameters. Laboratory results are described and evaluated in Section 5.4.

3.4.5 Off-Site Containment and Kapica Area

According to facility records and an interview with ACS facility personnel, the Off-Site Drum Containment Area was an area used to dispose of drums of waste material which could not be processed at the ACS facility. The area, located south of the fenced ACS facility was owned by ACS and used for a number of years as an open dump for the drums and still bottoms waste. In the early 1970s, IDEM required ACS to close the area by building a berm around the 300 by 400 foot accumulation of drums and capping it with clay.

The north and west berm around the area are clearly visible on the Site topography map (Figure 2-2), because of the numerous closely spaced contour lines. No steep berms are evident on the south and east boundaries to indicate the extent in those directions. Rather, the ground surface slopes gently downward to the south and east.

The Kapica Drum Recycling area was used by Mr. Kapica from the 1960s to 1980 and then from 1981 to 1987 by Mr. Pazdro to recycle and clean used drums for ACS Inc. The ground surface is gravelly and has little vegetation. There are numerous pieces of metal

debris, many drum lids and drum lid clasps scattered across the ground. In several locations, "pancakes" of rubbery material are seen. These "pancakes" are circular, several feet in diameter and several inches thick. They appear to be the organic aggregate knocked out of the bottom of used drums.

The field investigation for the Off-Site Containment area was conducted in two phases. The purpose of the first phase was to identify any potential contaminant sources above and below ground in the area; the purpose of the second phase was to document the horizontal and vertical extent of the contamination, and to identify the concentrations of the contaminants present. Investigative procedures included the following:

3.4.5.1 Phase I Investigation. The Phase I investigation was initiated by conducting EM and magnetometer geophysics surveys across the entire Off-Site Containment and Kapica Areas (Figure 1.2) in a 15-foot grid. Geophysical data and contour plots are included in Appendix C.

Twenty major anomaly areas were identified from the geophysical results. Five anomalies were identified in the Kapica vicinity and 15 across the remaining Off-Site Area to the north. Each of the anomalies was investigated by auger probe. Auger probes AP-1 through AP5 were performed in the Kapica area, and AP-6 through AP-20 were performed on the Off-Site Area. The methodology is summarized in Section 2.3.3 and the field observations of each is compiled in Appendix G.

The Work Plan state that nine soil boring locations would be selected across the Off-Site Containment and Kapica Areas and allocated full parameter TCL and TAL samples from two discrete depths at each. On the basis of the geophysical surveys and auger probe findings, six soil boring locations were selected on the Off-Site Containment Area and three locations were selected in the Kapica Area. Rationale for the selected locations are as follows. Analytical results are presented in Appendices Q-6 and R-6.

Kapica Area Soil Borings:

SB01 was drilled and sampled between auger probes AP-1 and AP-2 to investigate the nature of the elevated HNu readings in the stained soils near the northwest corner of the Kapica building. Samples SB01-3' and SB01-9' were submitted for analysis.

SB02 was drilled and sampled near auger probe AP-5 to identify the source of elevated HNu readings and the nature of underlying soil near several drum lids found at the surface. Samples SB02-7' (5.5' for VOCs) and SB02-8.5' were submitted for analysis.

SB03A was drilled near auger probe location AP-3 to identify the causes of the elevated HNu readings and stained underlying soils. Drilling was unsuccessful because of obstructions encountered directly below the ground surface (probably drum carcasses). No samples from SB03A were submitted for analysis. Test pit TP-1 was made at this location and SB03 boring number was used for a boring at the Off-Site containment Area.

Off-Site Containment Area Soil Borings:

SB03 was drilled and sampled between auger probes AP-17 and AP-18 to investigate the nature of elevated HNu readings and the character of landfill refuse. Sample SB03-12', SB03-17', and SB03-20' were submitted for analysis.

SB04 was drilled and sampled in a central location between auger probes AP-13 and AP-14. While drilling and sampling SB04, a dark viscous liquid was encountered approximately 5 feet below the ground surface. The liquid accumulated inside the hollow stem augers and coated the split-spoon sampler. Field sampling procedures were modified in order to collect a sample of the liquid waste. The soil boring was terminated at the 5 foot depth to avoid transporting the waste deeper with the auger. A sample of the liquid was submitted for the sample, SB04-5'.

SB04A was drilled and sampled about 10 feet south of SB04 to obtain a deeper sample. Sample SB04A-19' was collected and submitted for analysis.

SB05 was drilled and sampled between auger probes AP-12 and AP-15 to investigate the nature of the dark oily wastes encountered in the nearby probe locations. Similar waste material and undersoils were encountered and sampled at this location. Samples SB05-14' and SB05-17' were submitted for analysis.

SB06 was drilled and sampled near auger probe AP-6 to investigate the waste characteristics at that location. Samples SB06-11.5' and SB06-15' were collected and submitted for analysis.

SB07 was drilled and sampled near auger probe location AP-19 to investigate the waste material encountered at the location. Samples SB07-14' and SB07-19 were submitted for analysis.

3.4.5.2 Phase II Investigation. The evaluation of the Phase I data indicated that there are: 1) high levels of VOCs throughout much of the Off-Site Containment Area, and 2) relatively high levels of PAHs and PCBs at several locations in the eastern portion of the Off-Site Containment Area, and PCB contamination in the surficial soils at the Kapica area. In addition, several surface ponds or lagoons were identified in aerial photographs from 1970 and 1973 between Kapica and the Off-Site Containment Area, and evaluation of the activities in the Kapica area suggested that there might be a potential for VOC accumulation in the water table zone.

It was agreed among the U.S. EPA, the PRP technical subcommittee, and Warzyn that the Phase II sampling designated in the approved Work Plan would be insufficient to adequately characterize the vertical and horizontal extend of contaminants. Thus, the Phase II RI was supplemented with the Supplemental Technical Investigation (STI).

Off-Site Containment Area. Phase II sampling in the Off-Site Containment area was conducted to develop the data to differentiate the areas with only VOC contamination from the areas with VOCs mixed with PAHs and PCBs. Three sub-areas were identified in the Off-Site Area.

Eight soil borings were made in the eastern part of the Off-Site Containment area to collect samples at three discrete depths for the analysis of VOCs and PCBs. The sampling locations, shown on Figure 2-2, include the following:

SB24	SB24R
SB25	SB25R
SB26	SB26R
SB27	SB27RR
SB28	
SB29	
SB36	
SB37	

Initially, each boring was drilled to a depth of 21 feet and discrete samples were collected at the 12-foot and 21-foot depths. Later, the borings designated with the "R" suffix were re-drilled to the bottom of the upper aquifer (a depth between 24 and 29

feet) to collect a sample to evaluate for potential accumulation of dense non-aqueous phase liquids (DNAPL) waste. All samples were submitted to the laboratory for the analysis VOCs and PCBs.

Soil borings SB36 and SB37 were conducted to complete sampling in the east central portion of the Off-Site Containment Area. Samples were collected from each boring at three depths, 10 feet, 17 feet and 23.5 feet and submitted for analysis of VOCs and PCBs.

The northwest portion of the Off-Site Containment area was further investigated by performing soil borings SB38 and SB39. These soil borings were sampled at three depths and each sample was submitted for analysis of VOCs and PCBs. The sample depths were as follows:

8-10 feet	approximate level of buried waste
17-20 feet	native soil underlying buried waste
23-25 feet	bottom of the upper aquifer

The Phase I samples indicated that the waste buried in the Off-Site Containment Area was both widespread and consisted of VOCs, PAHs, and PCBs. It was apparent that further sampling should be conducted to the southwest to determine whether or not the area also contained buried waste. Therefore, soil borings were made and sampled in two new areas.

Soil borings SB28 and SB29 were drilled in the southern portion of the Off-Site Containment Area (Figure 2-2). The samples were collected from a depth of 8 feet to represent the water table zone and analyzed for full TCL and TAL parameters.

Twelve auger probes (AP-63 to AP-71) were drilled to a depth of 13.5 feet in the area southwest of the Off-Site Containment Area (locations shown on Figure 2-2). The observations are summarized in Appendix G. In general, these auger probes did not indicate buried waste. Three soil boring locations, SB40, SB41, and SB42, were selected to represent the subsurface conditions in this area. All samples were analyzed for full TCL and TAL parameters.

SB40 was advanced to a depth of 10 feet to collect a sample representative of the water table condition.

SB41 and
SB42 were both advanced to the bottom of the upper aquifer. At each location, one sample was collected at a depth of 5.5 feet to represent conditions at the water table and a second sample was collected at 23.5 feet to represent the conditions at the base of the upper aquifer.

During the Phase II sampling an area was observed where a dark oily substance was observed on the ground surface. The area is identified as waste sample WS01 (Figure 2.2). The waste appeared to be leaking from underground, so a series of six auger probes (AP-72 through AP-77) and three split-spoon samples were performed to document the vertical and horizontal extent. The probes and split-spoon samples indicate that oily waste is contained in an area 35 feet by 25 feet horizontally to a depth of 7 feet. A sample (WS01) was collected of the oily substance and submitted for full TCL/TAL analysis.

Kapica Drum Recycling Area. Phase II of the investigation in the Kapica vicinity was conducted for two purposes: 1) to document the vertical and horizontal extent of PCB contamination in the surficial soils and 2) to determine if there is significant VOC contamination in the water table zone. The investigation of surficial PCB contamination is discussed above in section 3.3.2.

To evaluate the potential for VOC contamination at the water table, 10 auger probes were performed (AP-54 through AP-57 and AP-78 through AP83) to provide a field screening of potential VOC contamination. On the basis of the auger probe observations, five soil borings were made to collect samples from the water table zone for VOC analysis. Samples were collected from the water table vicinity at the following soil boring locations and submitted to the laboratory for analysis of VOCs.

SB31	SB43	SB46	SB49	SB52
SB32	SB44	SB47	SB50	SB53
SB33	SB45	SB48	SB51	SB54

The soil boring logs are included in Appendix D. Analytical results are discussed in Section 5.4.

TABLE 1-1
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Activity	Data Generated	Presentation
PHASE I		
Review avail. info.	Site History, Physical Setting Local Groundwater Usage	Sections 1,4 Figures 4-1, 4-8, 4-11 Tables 1-2, 1-3, 2-6 Appendices A, B, L
Survey Site Boundaries	Site Grid Site Boundary Location	Figure 1-1
Geophysical Survey	EM Survey (Off & On-Site) Magnetic Survey (Off-Site) EM In-Phase (Still Bottoms)	Section 3 Appendix C
Surface Water Survey	Surface Water Measurement Locations	Figure 2-3
Install Piezometer Grid	Groundwater Elevation Measurement Locations	Figure 2-3 Table 2-1
Install Monitoring Wells	Boring Logs Construction Details Site Stratigraphy	Section 4 Figures 4-2 to 4-7 Tables 2-1, 2-3, 4-2 Appendices D, E and K
Install Leachate Wells	Construction Details	Section 4 Figure 2-3 Table 2-1
Effluent Sampling	Analytical data	Appendices Q and R
Perimeter Well Sampling	Analytical Data	Section 5 Appendices K, Q and R
Leachate Well Sampling	Analytical Data	Section 5 Appendices K, Q and R

TABLE 1-1
(continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Activity	Data Generated	Presentation
Surface Water/Sediment Sampling	Analytical Data Appendices K, Q and R	Section 5
Soil Borings/Test Pits/ Surface Soil	Boring Logs Waste Extent Analytical Data Site Stratigraphy	Sections 3, 4, and 5 Figures 2-1, 2-2, 4-3 to 4-7 Table 4-2 Appendices D, H, Q, R
Auger Probes	Waste area definition HNu Readings	Section 3 Figures 2-1 and 2-2 Appendix H
Aquifer Testing	Permeability Data	Section 4 Figure 4-12 Table 2-4 Appendix I
Physical Testing At 6 Monitoring Wells	Grain Size Data Permeability Data	Section 4 Tables 2-2 and 4-3 Appendix F
Private Well Sampling	Analytical Data	Section 5 Appendices K, Q, and R
Water Level Measurements	Groundwater Elevations	Section 4 Figures 4-13 to 4-16, 4-19 Table 2-5 Appendix O
Climatological Data Collection	Precipitation records for 1/89-90	Section 4 Table 4-1 Appendix M
PHASE II		
Install Lower Aquifer Wells	Boring Logs Construction Details Stratigraphy	Section 4 Figures 4-2 to 4-7 Tables 2-1, 2-3, 4-2 Appendices D and E

TABLE 1-1
(continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Activity	Data Generated	Presentation
Water Level Measurements	Groundwater Elevations	Section 4 Tables 2-5, 4-4, 4-6 Figures 4-13 to 4-16, 4-19,
	4-21	Appendix O
Tracer Groundwater Investigation	VOC Scan Data	Sections 3 and 5 Figures 2-5 and 2-6 Appendix J
Install Upper Aquifer Wells	Boring Logs Construction Details Site stratigraphy	Section 4 Table 2-1, 2-3, and 4-2 Appendices D and E Figures 4-2 to 4-7
Collect Aquifer Matrix Samples	Analytical results	Figure 2-3 Appendices Q and R
Groundwater Sampling	Analytical Data	Section 5 Appendices K, Q and R
Aquifer Testing	Permeability Data	Section 4 Tables 2-4, 4-5, 4-7 Figure 4-12 Appendix I
Physical Testing	Grain Size; Porosity; TOC; Atterberg Limits	Section 4 Tables 2-2, 4-3 Appendix F
Sediment Sampling	Analytical Data	Section 5 Figure 2-4 Appendices Q and R
Wetland Delineations	Report by US Fish and Wildlife	Appendix N
Auger Probes	Waste extent and Hnu Readings	Section 3 Appendix G

TABLE 1-1
(continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Activity	Data Generated	Presentation
Soil borings and Soil Sampling Site Stratigraphy	Analytical Data Boring Logs 4-7. Table 4-2 Waste Extent	Section 3, 4 and 5 Figures 2-1, 2-2, and 4-3 to Appendices D, Q and R
Field measurements of pH, T, DO, Redox,	Groundwater quality	Section 5 Appendix
Environmental Audit	Details of Site History/ Processes	Section 1 Table 1-3 Appendix B

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Table 1-2

Summary of Disposal Practices
American Chemical Services, Inc. and Kapica Drum, Inc.
American Chemical Services NPL Site
Remedial Investigation

Disposal Practice	Period	Type	Quantity	Location	Comments
AMERICAN CHEMICAL SERVICE, INC.					
Landfilling	1955-1977			Off-site Containment Area	Containers punctured as they were landfilled
		55 gal. drums of PCB contaminated waste	6 drums		
		Non-reclaimable still bottoms			
		Drums containing solidified materials Ex: Latex paint, solid resin			
	1956-1975	Distillation bottoms	10,000 cy		
		Solid material rec'd for reclamation			
		Solid material rec'd for incineration			
		Paper			
		Incinerator ashes	68 cy		
		Ignitable and corrosive hazardous wastes			
		Chlorinated solvent, acetone and MEK bottoms			
		Spent cresylic acid, cyanide and chromium from plating			
		Lead pigments			
		Empty bottles that had contained 2,4,D and 2,4,5-TP	Several 100 cases		
		1 tank truck containing 500 gallons solidified paint			

Table 1-2
(continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Disposal Practice	Period	Type	Quantity	Location	Comments
Landfilling	Mid 60's	Sludge and semi-solids of unknown type	400 drums	On-site Containment area	
Landfilling	1969-1975	Solids in drums-questionable as to content, but probably solvent solids of benzene, Amylacetate, dimethyl aniline, diethylether	200 drums	Treatment Pond #1 or Off-site Containment Area	During this time the 2,4,D and 2,4,5-TP plus an unknown amount of DDT was incinerated
Landfilling	1955-1967	Trash		City of Griffith Indiana Landfill	
		Retained samples (contained hazardous substances)	10 gal/wk		
Pond Disposal	1955-1972	Still bottoms sludges from reclamation processes sludges containing 1,1,1-trichloroethane, trichloroethylene, methylene chloride, toluene, benzene, and other low boiling solvents	253,510 gal still bottoms sludge and 2,000 partially filled drums	Old Still Bottoms Pond (125' dia x 4.5' deep)	
		Partially filled drums of semi-solid paint, lacquer and ink waste	41,612 gal sludge; 1,000 partially filled drums	Old Treatment Pond #1 (180' x 70' x 3' deep)	Treatment Pond #1 and the still bottoms pond were filled and sealed in 1972. During closing the liquid portion of Treatment Pond #1 and the Still Bottom Pond were drained leaving the heavy sludges. Drums were placed on top of the pond, punctured and crushed. Ponds were "closed off" by sand fill and compacting
	1968-1976	Aqueous phase containing small quantities of organic (some hazardous) solvents		Treatment Pond #2 (Fire Pond) (180'x70'x10' deep)	Supposedly biodegradable wastewater overflow from Treatment Pond #1 and API oil decanter was discharged here. Overflow from Treatment Pond #2 went to the marsh from 1968-1974 and to the POTW from 1974 to present

Table 1-2
Continued
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Disposal Practice	Period	Type	Quantity	Location	Comments
Treatment Pond Inter-connections					
API Oil Decanter	1963-1967	1,1,1-trichloroethane, trichloroethylene, methylene chloride, toluene, benzene and other low boiling solvents		API oil decanter	Dimensions are 15'x15'x5' 1963-1967-wastewater flowed directly to marsh 1967-1972-wastewater flowed to TP #1 then to marsh 1972-1974-wastewater flowed to TP #2 then to marsh
Trenches	1955-1976	Reclamation residues containing above-mentioned compounds		Trench #1 (1'x2'x125')	Conducted wastewater to Trench #2
	1955-1976	Reclamation residues containing above-mentioned compounds		Trench #2 (1'x2'x110')	1955-1963-conducted wastewater from reclamation facility to marsh 1963-1976-to API oil decanter Replaced in 1976 by a close-pipe system
	1963-1976	Aqueous phase w/small quantities of organic (some hazardous) solvents		Trench #3 (1'x2'x70')	(1963-1967): conducted wastewater from API oil decanter to marsh. All trenches are presently filled, and the area is used as a roadway
KAPICA DRUM, INC. (Later Pazmey Corp.)					
DISPOSAL OF CONTENTS					
	1961-1971	If drums sent to Kapica contained liquid, the contents were dumped on the ground	330 yd^3	Kapica Dump site	
		OR			
		Combined to generate full drums	2,500 drums	Griffith Sanitary Landfill	
	1978-1980	Paint residue sludge from Kapica Drums, Inc.	250 gal/wk	ACS sludge box	For disposal of Gary Development Landfill

Table 1-2
Continued
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Disposal Practice	Period	Type	Quantity	Location	Comments
DISPOSAL OF RINSE WATER					
	1961-1971	Unknown	Unknown	West end of Kapica property	
Drum Washing	1962-1983	Liquid Waste		Flowed intermittently onto ACS property from Kapica Drums, Inc. and Pazmey Corp.	
Drum Reconditioning	1962-July 1980	Empty drums from ACS were picked up and reconditioned by Kapica		Kapica Drums	After August, 1980, ACS bought new drums from Kapica (who sold out to Pazmey in 2/80)
	1962-1980	1,000 gal. H_2O containing 600 lbs. NaOH(s) + 400 lbs Na_3PO_4(s)	3 times/year	Unknown	Used for washing drums at Kapica

Notes:
Table has been modified from: "Initial Site Evaluation", Camp Dresser and McKee, Inc., March 26, 1985, Table 3.
Information contained in Table 3 is from the ACS response to U.S. EPA Request for Information (October 18, 1984).

V251RI Table 1-2/JAW/mp/PJV

TABLE 1-3

Event Chronology
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Date	Event
1950's	Griffith Landfill begins operations.
1951	Kapica Drum begins operations.
1954	Aerial photograph available (Appendix A).
May 1955	ACS begins operations as a solvent recovery facility.
1958	Aerial photograph available (Appendix A).
1955-1968	"Occasional" leaking of drums in drum storage area.
1960s	Leaching and/or runoff from the Still Bottoms Pond reportedly kills off vegetation in marsh area to west of site.
1968	Small fire in drum storage area; several hundred gallons of material spilled.
1970	Aerial photograph available (Appendix A).
1972	Still Bottoms Pond and Treatment Lagoon #1 taken out of service. Use of Off-Site Containment Area discontinued.
1973	Aerial photograph available (Appendix A).
1972-1973	ISBH inspections and concern regarding waste handling, site maintenance and spill prevention.
1974-1975	ISBH expresses concerns regarding discharge of chemicals to sewer and alleged dumping.
Feb 1980	U.S. EPA makes identification and preliminary assessment of ACS as potential hazardous site.
May 8-9, 1980	U.S. EPA samples soil, leachate and surface water in vicinity of Griffith Landfill and Off-Site Containment Area. Leachate noted emanating from Off-Site Containment Area and Griffith Landfill.

TABLE 1-3
(Continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Date	Event
Aug 19, 1980	U.S. EPA requires ACS to provide containment measures to prevent oily discharge from the Off-Site Containment Area.
Sep 9, 1980	U.S. EPA FIT performs on-site investigation/inspection. Leachate springs and vegetation damage noted in Off-Site Containment Area.
1981	Aerial photograph available (Appendix A).
July 1982	U.S. EPA FIT installs four monitoring wells at ACS Site.
June 1983	ACS receives a composite HRS Score of 34.98.
Sep 1983	Pazmey Corporation receives notice of violation from ISBH for allowing run-off of caustic rinsewater onto the ground.
1984	Seven private wells are sampled in the Site vicinity by the Lake County Health Department.
1984	ATEC performs a Preliminary Hydrogeologic Site Assessment for ACS.
Nov 29, 1984	Site Assessment is performed by the U.S. EPA TAT centering on the Off-Site Containment Area and the area of Treatment Lagoon #1.
1986	Steering Committee formed by PRPs to organize, oversee, and determine funding of RI/FS.
1987	Operation of Kapica Drum/Pazmey Corp. discontinued.
Mar 1987	Roy F. Weston develops Final Work Plan for ACS for U.S. EPA.
Apr 1988	Warzyn Engineering Inc. develops a Work Plan for the ACS RI/FS and receives U.S. EPA approval.
June 30, 1988	Effective date of Administrative Order of Consent (AOC).
July 1989	Phase I field work commences at the ACS Site.

TABLE 1-3
(Continued)
Summary of Data Collected During RI
American Chemical Services NPL Site
Remedial Investigation

Date	Event
June 1, 1989	U.S. EPA TAT conducts soil and groundwater sampling at the Griffith Landfill.
Mar 1990	Phase II investigation commences at the ACS Site.

251RI Table 1-3/JAW/jaw/PJV

TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-10C	MW-11
Ground Surface Elevation (ft MSL)	635.7	634.8	634.1	638.2	639.4	653.0	638.7	638.2	635.9	633.0	634.7	637.5
Total Depth of Boring (ft)	17.0	22.0	15.0	20.0	22.0	34.0	50.0	47.0	35.0	35.0	25.0	21.0
T.O.I.C. Elevation (ft MSL)	638.16	638.14	638.56	641.06	642.20	655.25	641.51	640.49	639.05	635.58	637.59	640.52
Well Materials	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS
Screen Materials	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS
Screen Length (ft)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0	5.0	10.0
Slot Size (in)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Geologic Formation at Screen	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand
Depth to Clay	15.0	19.0	14.0	19.5	21.0	32.0	20.5	21.2	16.6	13.8	15.7	20.3
Elevation of Clay	620.7	615.8	620.1	618.7	618.4	621.0	618.2	617.0	619.3	619.2	619.0	617.2
Top of Seal - Depth (ft)	2.1	2.0	1.5	4.0	3.0	15.0	30.0	31.0	23.6	24.0	15.4	2.5
- Elevation (ft MSL)	633.6	632.8	632.6	634.2	636.4	638.0	608.7	607.2	612.3	609.0	619.3	635.0
Top of Sand Pack - Depth (ft)	3.1	3.8	3.5	5.3	5.0	17.0	38.0	33.5	26.0	26.7	17.7	4.8
- Elevation (ft MSL)	632.6	631.0	630.6	632.9	634.4	636.0	600.7	604.7	609.9	606.3	617.0	632.7
Top of Screen - Depth (ft)	4.5	6.5	4.5	7.0	7.5	20.0	42.8	40.0	30.0	30.0	20.0	7.5
- Elevation (ft MSL)	631.2	628.3	629.6	631.2	631.9	633.0	595.9	598.2	605.9	603.0	614.7	630.0
Bottom of Well Point - Depth (ft)	14.5	16.5	14.5	17.0	17.5	30.0	47.8	45.0	35.0	35.0	25.0	17.5
- Elevation (ft MSL)	621.2	618.3	619.6	621.2	621.9	623.0	590.9	593.2	600.9	598.0	609.7	620.0
Map Coordinates: North	5783.0	6838.7	7358.7	7126.3	6482.0	5520.1	6732.1	7506.4	6990.5	7783.5	7553.5	7328.8
East	4304.6	5033.1	5340.6	6112.2	5788.1	5297.6	6112.4	5934.1	4893.1	5199.7	5229.3	6377.4
Completion Date	25-Jul-89	24-Jul-89	21-Jul-89	20-Jul-89	19-Jul-89	18-Jul-89	14-Mar-90	16-Mar-90	21-Mar-90	01-May-90	03-Apr-90	29-Mar-90

NOTES: T.O.I.C. - Top of Inner Well Casing
ID - Inside Diameter
SS - Stainless Steel
MSL - Mean Sea Level
NA - Data Not Available

TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	LW-01	LW-02	LW-03	LW-04	P-01
Ground Surface Elevation (ft MSL)	639.7	631.9	636.0	635.2	638.3	648.3	645.4	642.4	647.4	643.3	641.5	641.2
Total Depth of Boring (ft)	22.5	15.0	17.0	17.0	17.0	25.0	23.5	25.0	27.5	23.5	28.5	12.5
T.O.I.C. Elevation (ft MSL)	642.79	634.17	638.59	637.91	638.54	647.10	644.88	644.61	649.89	645.63	643.30	642.85
Well Materials	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID PVC	2"ID PVC	2"ID PVC	2"ID PVC	1.5" PVC
Screen Materials	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID SS	2"ID PVC	2"ID PVC	2"ID PVC	2"ID PVC	1.5" PVC
Screen Length (ft)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0
Slot Size (in)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Geologic Formation at Screen	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	F-M Sand	Refuse	Refuse	Refuse	Refuse	Sand
Depth to Clay	20.2	12.8	16.8	14.9	16.8	NA	20.0	23.0	26.0	NA	27.0	NA
Elevation of Clay	619.5	619.1	619.2	620.3	619.5	NA	625.4	619.4	621.4	NA	614.5	NA
Top of Seal - Depth (ft)	2.8	1.0	1.5	2.0	2.3	8.3	7.0	9.0	13.0	8.0	12.0	0.0
- Elevation (ft MSL)	636.9	630.9	634.5	633.2	634.0	640.0	638.4	633.4	634.4	635.3	629.5	641.2
Top of Sand Pack - Depth (ft)	5.1	2.0	3.0	3.0	4.0	10.0	9.5	11.0	14.5	11.3	14.0	6.0
- Elevation (ft MSL)	634.6	629.9	633.0	632.2	632.3	638.3	635.9	631.4	632.9	632.0	627.5	635.2
Top of Screen - Depth (ft)	7.5	3.3	5.5	4.4	6.0	13.0	12.0	14.5	17.5	13.5	17.0	7.0
- Elevation (ft MSL)	632.2	628.6	630.5	630.8	630.3	635.3	633.4	627.9	629.9	629.8	624.5	634.2
Bottom of Well Point - Depth (ft)	17.5	13.3	15.5	14.5	16.0	23.0	22.0	24.5	27.5	23.5	27.0	12.0
- Elevation (ft MSL)	622.2	618.6	620.5	620.7	620.3	625.3	623.4	617.9	619.9	619.8	614.5	629.2
Map Coordinates: North	6351.7	7814.4	6995.3	5002.2	6596.4	5677.3	5745.7	5070.4	5464.9	5821.0	6132.2	6365.2
East	6018.6	5051.4	4881.6	4719.6	5065.2	5656.3	5838.4	4806.8	4662.4	4482.6	4229.1	5699.7
Completion Date	30-Mar-90	04-Apr-90	04-Apr-90	04-Apr-90	05-Apr-90	05-Apr-90	29-Jun-90	12-Jul-89	13-Jul-89	13-Jul-89	14-Jul-89	05-Jul-89

NOTES: T.O.I.C. - Top of Inner Well Casing
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NA - Data Not Available

TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	P-02	P-03	P-04	P-05	P-06	P-07	P-08	P-09	P-10	P-11	P-12	P-13
Ground Surface Elevation (ft MSL)	642.5	638.0	636.9	635.6	636.7	641.2	636.8	637.8	646.9	647.0	646.7	649.4
Total Depth of Boring (ft)	12.0	10.0	10.0	10.0	10.0	15.0	6.0	9.0	20.0	15.0	20.0	20.0
T.O.I.C. Elevation (ft MSL)	645.59	639.89	639.28	636.62	638.77	643.64	639.21	638.90	649.37	649.17	650.11	651.48
Well Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Slot Size (in)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Geologic Formation at Screen	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Depth to Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Elevation of Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Top of Seal - Depth (ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	5.0	9.5	10.0
- Elevation (ft MSL)	642.5	638.0	636.9	635.6	636.7	641.2	636.8	637.8	636.9	642.0	637.2	639.4
Top of Sand Pack - Depth (ft)	5.0	2.5	2.0	2.0	3.0	6.0	1.0	1.5	12.0	7.0	11.5	12.0
- Elevation (ft MSL)	637.5	635.5	634.9	633.6	633.7	635.2	635.8	636.3	634.9	640.0	635.2	637.4
Top of Screen - Depth (ft)	6.5	4.0	3.0	3.5	5.0	10.0	1.5	3.0	15.0	10.0	14.0	15.0
- Elevation (ft MSL)	636.0	634.0	633.9	632.1	631.7	631.2	635.3	634.8	631.9	637.0	632.7	634.4
Bottom of Well Point - Depth (ft)	11.5	9.0	8.0	8.5	10.0	15.0	6.5	8.0	20.0	15.0	19.0	20.0
- Elevation (ft MSL)	631.0	629.0	628.9	627.1	626.7	626.2	630.3	629.8	626.9	632.0	627.7	629.4
Map Coordinates: North	6165.1	6469.4	6228.2	6510.2	6550.9	6639.5	6734.8	6994.0	5851.6	5900.0	5722.7	5735.0
East	5577.3	5452.8	5432.2	5285.1	5148.1	5949.8	6157.0	6134.3	5413.0	5199.3	5076.3	4878.1
Completion Date	05-Jul-89	06-Jul-89	06-Jul-89	06-Jul-89	06-Jul-89	07-Jul-89	07-Jul-89	07-Jul-89	10-Jul-89	10-Jul-89	11-Jul-89	11-Jul-89

NOTES: T.O.I.C. - Top of Inner Well Casing
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TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	P-14	P-15	P-16	P-17	P-18	P-19	P-20	P-21	P-22	P-23	P-24	P-25
Ground Surface Elevation (ft MSL)	647.4	637.4	648.2	648.5	644.3	637.5	640.1	632.3	632.2	632.5	633.3	632.1
Total Depth of Boring (ft)	20.0	9.0	20.0	20.0	13.0	10.0	12.0	8.0	10.0	NA	NA	NA
T.O.I.C. Elevation (ft MSL)	649.35	639.06	647.84	650.62	647.97	639.64	643.15	634.81	634.33	636.17	636.08	635.33
Well Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Slot Size (in)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Geologic Formation at Screen	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Depth to Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Elevation of Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Top of Seal - Depth (ft)	0.0	0.0	10.0	9.0	2.0	0.0	3.4	0.0	2.5	NA	NA	NA
- Elevation (ft MSL)	647.4	637.4	636.2	639.5	642.3	637.5	636.7	632.3	629.7	NA	NA	NA
Top of Sand Pack - Depth (ft)	7.0	1.5	12.0	11.5	4.0	2.5	5.0	1.5	3.6	NA	NA	NA
- Elevation (ft MSL)	640.4	635.9	634.2	637.0	640.3	635.0	635.1	630.8	628.6	NA	NA	NA
Top of Screen - Depth (ft)	13.0	3.0	15.0	15.0	8.0	5.0	6.0	2.5	5.0	NA	NA	NA
- Elevation (ft MSL)	634.4	634.4	631.2	633.5	636.3	632.5	634.1	629.8	627.2	NA	NA	NA
Bottom of Well Point - Depth (ft)	18.0	8.0	20.0	20.0	13.0	10.0	11.0	7.5	10.0	NA	NA	NA
- Elevation (ft MSL)	629.4	629.4	626.2	628.5	631.3	627.5	629.1	624.8	622.2	NA	NA	NA
Map Coordinates: North	5965.0	6197.6	5747.5	6009.2	6222.7	5043.4	6233.2	6475.2	6731.9	7018.4	7178.0	7488.7
East	4954.8	4884.1	4672.9	4628.4	4631.7	4976.9	5104.3	4834.4	4635.7	4688.5	5001.5	5156.2
Completion Date	11-Jul-89	11-Jul-89	11-Jul-89	12-Jul-89	12-Jul-89	12-Jul-89	25-Jul-89	25-Jul-89	25-Jul-89	NA	NA	NA

NOTES: T.O.I.C. - Top of Inner Well Casing
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TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	P-26	P-27	P-28	P-29	P-30	P-31	P-32	P-33	P-34	P-35	P-36	P-37
Ground Surface Elevation (ft MSL)	631.2	636.0	640.8	638.5	639.6	638.2	639.3	637.2	637.1	637.9	641.9	639.3
Total Depth of Boring (ft)	8.0	10.0	14.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	15.0	10.0
T.O.I.C. Elevation (ft MSL)	634.23	639.68	644.53	642.34	642.49	641.05	641.79	640.08	639.38	641.72	644.82	641.37
Well Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Length (ft)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Slot Size (in)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Geologic Formation at Screen	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Depth to Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Elevation of Clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Top of Seal - Depth (ft)	0.0	1.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Elevation (ft MSL)	631.2	634.4	636.8	638.5	639.6	638.2	639.3	637.2	637.1	637.9	641.9	639.3
Top of Sand Pack - Depth (ft)	1.0	3.5	5.5	2.3	3.2	2.4	2.0	2.3	2.8	1.5	4.5	3.0
- Elevation (ft MSL)	630.2	632.5	635.3	636.2	636.4	635.8	637.3	634.9	634.3	636.4	637.4	636.3
Top of Screen - Depth (ft)	2.0	5.0	6.5	3.0	4.0	4.0	4.0	4.0	5.0	3.0	7.0	5.0
- Elevation (ft MSL)	629.2	631.0	634.3	635.5	635.6	634.2	635.3	633.2	632.1	634.9	634.9	634.3
Bottom of Well Point - Depth (ft)	7.0	10.0	11.5	8.0	9.0	9.0	9.0	9.0	10.0	8.0	12.0	10.0
- Elevation (ft MSL)	624.2	626.0	629.3	630.5	630.6	629.2	630.3	628.2	627.1	629.9	629.9	629.3
Map Coordinates: North	7360.6	7020.4	7485.8	6619.0	6815.8	7159.0	7007.9	7130.3	6692.0	6583.5	6842.0	6948.9
East	4726.5	4903.7	5882.6	5738.0	5606.5	5480.3	5741.8	5218.7	5279.7	5506.7	5412.1	5329.7
Completion Date	28-Jul-89	28-Jul-89	28-Jul-89	07-Aug-89	07-Aug-89	07-Aug-89	07-Aug-89	08-Aug-89	08-Aug-89	08-Aug-89	08-Aug-89	08-Aug-89

NOTES: T.O.I.C. - Top of Inner Well Casing
ID - Inside Diameter
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TABLE 2-1
SUMMARY OF
WELL CONSTRUCTION DETAILS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	P-38	P-39	P-40	P-41
Ground Surface Elevation (ft MSL)	637.8	638.8	636.5	635.6
Total Depth of Boring (ft)	10.0	10.0	10.0	10.0
T.O.I.C. Elevation (ft MSL)	639.87	641.49	639.31	638.53
Well Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Materials	1.5" PVC	1.5" PVC	1.5" PVC	1.5" PVC
Screen Length (ft)	5.0	5.0	5.0	5.0
Slot Size (in)	0.010	0.010	0.010	0.010
Geologic Formation at Screen	Sand	Sand	Sand	Sand
Depth to Clay	NA	NA	NA	NA
Elevation of Clay	NA	NA	NA	NA
Top of Seal - Depth (ft)	0.0	0.0	0.0	0.0
- Elevation (ft MSL)	637.8	638.8	636.5	635.6
Top of Sand Pack - Depth (ft)	3.3	2.5	0.7	1.0
- Elevation (ft MSL)	634.5	636.3	635.8	634.6
Top of Screen - Depth (ft)	5.0	4.0	2.0	2.0
- Elevation (ft MSL)	632.8	634.8	634.5	633.6
Bottom of Well Point - Depth (ft)	10.0	9.0	7.0	7.0
- Elevation (ft MSL)	627.8	629.8	629.5	628.6
Map Coordinates: North	6992.3	6902.0	7228.9	7353.1
East	5148.6	5939.7	5879.9	5702.1
Completion Date	08-Aug-89	10-Aug-89	10-Aug-89	10-Aug-89

NOTES: T.O.I.C. - Top of Inner Well Casing
ID - Inside Diameter
SS - Stainless Steel
MSL - Mean Sea Level
NA - Data Not Available

TABLE 2-2
Summary of Laboratory Physical Soil Analysis
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Hydrogeological Unit	Sample Depth (ft)	Bottom Elevation (msl)	Well Number	Material Description (USCS)	Initial Moisture Content (%)	Wet Sieve % Gr	Wet Sieve % Sand	Hydrometer % Silt	Hydrometer % Clay	Porosity	Total Organic Carbon(a)
Vadose Zone	3.5–5.0	630.7	MW-1	Black Fine SAND, Some Silt, Little Clay (SM)	25.4	0.0	81.5	12.5	6.1	NM	NM
Vadose Zone	3.5–5.0	629.8	MW-2	Brown Fine–Medium SAND, Little Silt & Clay, Trace Gravel (SP–SM)	16.4	1.3	85.5	6.3	6.8	NM	NM
Vadose Zone	1.0–2.5	631.6	MW-3	Brown Fine SAND, Trace Silt & Clay (SP)	21.7	0.0	95.6	1.8	2.7	NM	NM
Vadose Zone	3.5–5.0	633.2	MW-4	Brown Fine–Coarse SAND, Little Gravel, Trace Silt & Clay (SP)	21.7	7.1	84.6	4.2	4.1	NM	NM
Vadose Zone	3.5–5.0	634.4	MW-5	Brown Fine–Coarse SAND, Little Gravel & Silt, Trace Clay (SP–SM)	13.0	10.2	76.9	8.5	4.3	NM	NM
Vadose Zone	6.0–7.5	645.5	MW-6	Brown Fine SAND, Trace Clay (SP)	3.7	0.0	98.7	0.3	1.0	NM	NM
Upper Aquifer	13.5–15.0	620.7	MW-1	Gray Fine SAND, Trace Silt & Clay (SP)	15.6	0.0	95.8	2.8	1.4	NM	NM
Upper Aquifer	11.0–12.5	622.3	MW-2	Gray Fine–Coarse SAND, Little Silt, Trace Clay & Gravel (SP–SM)	19.4	2.0	87.8	6.0	4.2	NM	NM
Upper Aquifer	11.0–12.5	621.6	MW-3	Gray Fine–Medium SAND, Trace Silt & Clay (SP–SM)	22.1	0.0	92.6	4.4	3.0	NM	NM
Upper Aquifer	11.0–12.5	625.7	MW-4	Brown Fine–Coarse SAND, Little Gravel, Trace Silt & Clay (SP–SM)	15.8	8.9	83.5	4.6	3.0	NM	NM
Upper Aquifer	8.5–10.0	629.4	MW-5	Gray Fine–Coarse SAND & GRAVEL, Little Silt, Trace Clay (SP–GM)	16.4	43.2	47.4	6.8	2.6	NM	NM
Upper Aquifer	21.0–22.5	630.5	MW-6	Brown Fine–Coarse SAND, Trace Silt, Clay & Gravel (SP)	19.0	1.0	94.4	2.4	2.2	NM	NM
Upper Aquifer	10.0–17.0	621.7	MW-7	Brown Fine–Coarse SAND, Little Gravel & Silt, Trace Clay (SP–SM)	NM	7.6	83.2	6.4	2.8	0.278	14000
Upper Aquifer	10.0–16.0	619.9	MW-9	Brown Fine–Medium SAND, Little Silt, Trace Clay & Gravel (SP–SM)	NM	1.1	88.9	5.5	4.5	0.311	2900

TABLE 2-2 (con't)
Summary of Laboratory Physical Soil Analysis
American Chemical Services NPL Site
Remedial Investigation

Hydrogeological Unit	Sample Depth (ft)	Bottom Elevation (msl)	Well Number	Material Description (USCS)	Initial Moisture Content (%)	Wet Sieve % Gr	Wet Sieve % Sand	Hydrometer % Silt	Hydrometer % Clay	Porosity	Total Organic Carbon(a)
Lower Aquifer	45.0–50.0	588.7	MW-7	Brown Fine–Medium SAND, Trace Silt, Clay & Gravel (SP–SM)	NM	1.4	92.3	4.4	1.9	0.295	6800
Lower Aquifer	26.0–35.0	600.9	MW-9	Brown Fine–Medium SAND, Little Silt, Trace Clay & Gravel (SP–SM)	NM	2.3	89.6	5.7	2.4	0.298	3100
						Average Permeability (K) (cm/s)					
Confining Layer	15.0–17.0	618.7	MW-1	Gray Lean CLAY, Trace Sand (CL)	22.0	6.0E-08				NM	NM
Confining Layer	20.0–22.0	612.8	MW-2	Gray Lean CLAY, Trace Sand (CL)	19.3	3.8E-08				NM	NM
Confining Layer	15.0–17.0	617.1	MW-3	Gray Lean CLAY, Trace Sand (CL)	16.1	3.2E-08				NM	NM
Confining Layer	18.0–20.0	618.2	MW-4	Gray Lean CLAY, Trace Sand (CL)	14.4	6.7E-07				NM	NM
Confining Layer	21.0–23.0	616.4	MW-5	Gray Lean CLAY, Trace Sand (CL)	16.2	5.8E-09				NM	NM
Confining Layer	32.0–34.0	619.0	MW-6	Gray Lean CLAY, Trace Sand (CL)	16.5	3.6E-08				NM	NM
Confining Layer	23.0–25.0	613.7	MW-7	Brown Lean CLAY, Little Sand, Trace Gravel (CL) LL=33, PI=19	13.0	7.9E-08				0.257	>16000(b)
Confining Layer	21.0–23.0	612.9	MW-9	Brown Lean CLAY, Some Sand, Little Gravel (CL) LL=21, PI=10	18.0	3.3E-08				0.327	12000(b)

Notes:
LL – Liquid Limit (The water content of the sample when it has a shear strength of 1 g/sq.cm)
PL – Plastic Limit (The range in water content between the liquid limit and the plastic limit)
Wet Sieve (Test performed to measure percent of silt and clay in the sample)
Hydrometer (Test performed to measure percent of gravel and sand in the sample)
(msl) – Elevation in Mean Sea Level
NM – Not Measured
Falling Head Permeability Test was performed on a relatively undisturbed 3-inch Shelby tube sample
(a) – Total Organic Carbon (mg/kg dry wt.)
(b) – Total Organic Carbon Analyzed from jar samples not shelby tube samples

Table 2-3

Summary of Well Development Data
American Chemical Service NPL Site
Remedial Investigation
Griffith, Indiana

Well No.	Date	Depth of Well	Water Level	Column	One Volume	Volume Purged	Comments
MW01	7/26/89	16.86	5.34	11.52	1.9	20	No odor, cloudy
MW02	7/26/89	18.21	6.55	11.66	1.9	20	Slight odor, cloudy
MW03	7/27/90	17.16	4.53	12.63	2.1	25	Strong leachate odor, cloudy
MW04	7/27/90	18.35	6.53	11.82	2.0	25	Strong odor, cloudy
MW05	7/27/90	20.23	7.33	12.90	2.1	25	Slight odor, cloudy
MW06	7/26/89	29.94	21.73	8.21	1.35	28.5	Slight odor, cloudy
MW07	3/16/90	50.57	18.08	32.50	5.33	55	No odor, cloudy
MW08	3/19/90	47.55	17.68	29.87	5.0	50	No odor, cloudy
MW09	3/21/90	37.57	15.86	21.71	3.6	36	No odor, cloudy
MW10	5/4/90	37.60	13.05	24.55	4.1	42	Slight odor, cloudy
MW10C	7/12/90	~25	~7	~18	~3.0	5	Bubbling water and venting gas
MW11	3/30/90	20.55	4.79	15.76	2.6	30	No odor, cloudy
MW12	4/2/90	20.55	6.80	13.75	2.2	25	No odor, cloudy
MW13	4/5/90	15.55	3.08	12.47	2.1	21	Leachate odor, cloudy
MW14	4/12/90	16.30	6.89	9.41	1.5	17	Medium recharge, slight odor, cloudy
MW15	4/12/90	16.85	4.15	12.70	2.1	21	No odor, cloudy
MW16	4/12/90	17.55	6.17	11.38	1.9	20	Strong leachate odor, cloudy
MW17	4/12/90	22.85	12.25	10.60	1.8	20	Petroleum odor with oil sheen, cloudy
MW18	6/30/90	21.30	8.03	13.27	2.2	24	No odor, cloudy

Notes:

Depth of well and water level in feet below ground surface.
Column in feet.
Volumes in gallons.
Volume purged at least 10 times one volume.

Table 2-4. Summary of Aquifer Test Results.

Upper Aquifer Wells

East Side Monitoring Wells	K ft/min					
MW-4	2.8E-03					
MW-5	2.3E-02					
MW-6	2.9E-02					
MW-11	2.6E-03	6.3E-03				
MW-12	3.8E-02					
MW-15	4.0E-02					
MW-17	1.5E-01					
MW-18	6.9E-03					
Avg:	1.5E-02	ft/min	2.6E-04	ft/sec	22.2	ft/day
Min:	2.6E-03	ft/min	4.4E-05	ft/sec	3.80	ft/day
Max:	1.5E-01	ft/min	2.5E-03	ft/sec	216	ft/day

West Side Monitoring Wells	K ft/min					
MW-1	3.5E-03					
MW-2	2.9E-03					
MW-3	4.2E-03					
MW-13	1.0E-02					
MW-14	4.3E-03					
MW-16	3.0E-04					
Avg:	2.9E-03	ft/min	4.8E-05	ft/sec	4.14	ft/day
Min:	3.0E-04	ft/min	5.0E-06	ft/sec	0.433	ft/day
Max:	1.0E-02	ft/min	1.7E-04	ft/sec	15.0	ft/day

Upper Aquifer Summary

Geometric Mean:	7.9E-03	ft/min
(15 values)	1.3E-04	ft/sec
	11.3	ft/day

Table 2–4 (continued). Summary of Aquifer Test Results.

Lower Aquifer Monitoring Wells

Monitoring Wells	K ft/min					
MW–7	4.6E–02					
MW–8	4.3E–02					
MW–9	4.2E–02					
MW–10	4.6E–02					
Avg:	4.4E–02	ft/min	7.4E–04	ft/sec	63.6	ft/day
Min:	4.2E–02	ft/min	7.0E–04	ft/sec	60.34	ft/day
Max:	4.6E–02	ft/min	7.7E–04	ft/sec	66.2	ft/day

Notes:

Permeability values obtained by bail testing.

Raw data and calculations are in Appendix I.

ACSRI Table 2–4/PJV/JAW

TABLE 2-5
Water Levels and Elevations
ACS NPL Site
Griffith, Indiana

Location	Coordinates East	Coordinates North	TOC	Ground Elev	Clay Elev	August 17, 1989 Depth to Water	August 17, 1989 Water Elev	September 8, 1989 Depth to Water	September 8, 1989 Water Elev	November 15, 1989 Depth to Water	November 15, 1989 Water Elev	February 2, 1990 Depth to Water	February 2, 1990 Water Elev	April 6, 1990 Depth to Water	April 6, 1990 Water Elev	July 18, 1990 Depth to Water	July 18, 1990 Water Elev	September 13, 1990 Depth to Water	September 13, 1990 Water Elev
P-1	5700	6385	642.85	641.2		8.61	634.24	8.32	634.53			8.46	634.39	7.19	635.66				
P-2	5577	6165	645.59	642.5		11.55	634.04	11.36	634.23			11.57	634.02	10.17	635.42				
P-3	5453	6469	639.89	638.0		5.72	634.17	5.23	634.66			5.37	634.52	4.44	635.45				
P-4	5432	6228	639.28	636.9		5.42	633.86	5.22	634.06			5.48	633.80	3.98	635.30			4.32	634.96
P-5	5285	6510	636.62	635.6		3.58	633.04	2.64	633.98			2.47	634.15	1.94	634.68			2.82	633.80
P-6	5148	6551	638.77	636.7		6.67	632.10	5.93	632.84			5.21	633.56	5.27	633.50				
P-7	5950	6640	643.64	641.2		9.30	634.34	8.89	634.75			8.80	634.84	7.76	635.88				
P-8	6157	6735	639.21	636.8		4.99	634.22	4.47	634.74			4.00	635.21	3.23	635.98			3.88	635.33
P-9	6134	6994	638.90	637.8		4.78	634.12	4.28	634.62			3.72	635.18	3.22	635.68				
P-10	5413	5852	649.37	646.9		15.73	633.64	15.65	633.72			15.87	633.50	14.38	634.99				
P-11	5199	5900	649.17	647.0		15.52	633.65	15.64	633.53			16.05	633.12	14.57	634.60			14.48	634.69
P-12	5076	5723	650.11	646.7		16.86	633.25	16.83	633.28			17.18	632.93	15.68	634.43				
P-13	4878	5735	651.48	649.4		18.33	633.15	18.35	633.13			18.80	632.68	17.18	634.30				
P-14	4955	5965	649.35	647.4		15.57	633.78	15.48	633.87			16.22	633.13	15.13	634.22				
P-15	4884	6198	639.06	637.4		7.12	631.94	6.86	632.20			6.29	632.77	5.11	633.95			5.90	633.16
P-16	4673	5748	647.84	646.2		14.40	633.44	14.31	633.53			15.05	632.79	13.22	634.62				
P-17	4628	6009	650.62	648.5		18.05	632.57	17.96	632.66			18.22	632.40	16.35	634.27				
P-18	4632	6223	647.97	644.3		3.35	644.62	3.04	644.93			5.05	642.92	5.05	642.92				
P-19	4977	5043	639.64	637.5		7.34	632.30	6.96	632.68			6.88	632.76	6.03	633.61				
P-20	5104	6233	643.15	640.1		10.05	633.10	9.37	633.78			9.24	633.91	8.25	634.90			8.38	634.77
P-21	4834	6475	634.81	632.3		5.15	629.66	4.19	630.62			3.96	630.85	4.21	630.60				
P-22	4636	6732	634.33	632.2		7.21	627.12	5.62	628.71			4.95	629.38	5.34	628.99				
P-23	4689	7018	636.17	632.5		7.88	628.29	6.65	629.52			11.80	624.37	5.38	630.79				
P-24	5002	7178	636.08	633.3		5.71	630.37	4.48	631.60			3.80	632.28	4.33	631.75				
P-25	5156	7489	635.33	632.1		4.22	631.11	3.46	631.87			3.36	631.97	3.37	631.96				
P-26	4727	7361	634.23	631.2		4.87	629.36	3.62	630.61			3.32	630.91	3.50	630.73			4.22	630.01
P-27	4904	7020	639.68	636.0		10.40	629.28	9.75	629.93			8.10	631.58	7.84	631.84			8.96	630.72
P-28	5883	7486	644.53	640.8		11.60	632.93	10.93	633.60			10.12	634.41	9.67	634.86			10.50	634.03
P-29	5738	6619	642.34	638.5		7.24	635.10	7.56	634.78			7.63	634.71	6.48	635.86				
P-30	5607	6816	642.49	639.6		7.90	634.59	7.47	635.02	8.60	633.89	7.61	634.88	6.68	635.81			7.04	635.45
P-31	5480	7159	641.05	638.2		6.98	634.07	6.24	634.81	7.25	633.80	5.96	635.09	5.94	635.11				
P-32	5742	7008	641.79	639.3		7.54	634.25	7.03	634.76			6.67	635.12	6.33	635.46			6.87	634.92
P-33	5219	7130	640.08	637.2		6.82	633.26	4.87	635.21	6.69	633.39	4.94	635.14	5.65	634.43				
P-34	5280	6692	639.38	637.1		5.76	633.62	4.91	634.47	6.98	632.40	5.27	634.11	4.69	634.69				
P-35	5507	6584	641.72	637.9		7.37	634.35	6.92	634.80	7.92	633.80	7.13	634.59	6.16	635.56				
P-36	5412	6842	644.82	641.9		10.26	634.56	9.54	635.28	10.33	634.49	9.57	635.25	8.80	636.02				
P-37	5330	6949	641.37	639.3		6.39	634.98	5.71	635.66	6.36	635.01	product		product					
P-38	5149	6992	639.87	637.8		6.63	633.24	5.29	634.58	7.22	632.65	5.10	634.77	5.34	634.53				
P-39	5940	6902	641.49	638.8		7.92	633.57	6.72	634.77			6.40	635.09	5.69	635.80				
P-40	5880	7229	639.31	636.5		5.45	633.86	4.84	634.47			4.27	635.04	4.15	635.16				
P-41	5702	7353	638.53	635.6		5.09	633.44	4.37	634.16			3.75	634.78	3.66	634.87				

TABLE 2-5
Water Levels and Elevations
ACS NPL Site
Griffith, Indiana

Location	Coordinates East	Coordinates North	TOC	Ground Elev	Clay Elev	August 17, 1989 Depth to Water	August 17, 1989 Water Elev	September 8, 1989 Depth to Water	September 8, 1989 Water Elev	November 15, 1989 Depth to Water	November 15, 1989 Water Elev	February 2, 1990 Depth to Water	February 2, 1990 Water Elev	April 6, 1990 Depth to Water	April 6, 1990 Water Elev	July 18, 1990 Depth to Water	July 18, 1990 Water Elev	September 13, 1990 Depth to Water	September 13, 1990 Water Elev
MW-1	4305	5783	638.16	635.7	621.0	5.50	632.66	4.03	634.13			NF		NF					
MW-2	5033	6839	638.14	634.8	617.0	6.87	631.27	5.65	632.49			5.11	633.03	5.46	632.68				
MW-3	5341	7359	636.56	634.1	620.0	4.48	632.08	3.48	633.08			3.02	633.54	3.31	633.25				
MW-4	6112	7126	641.06	638.2	619.0	7.08	633.98	6.51	634.55			5.95	635.11	5.48	635.58				
MW-5	5788	6482	642.20	639.4	618.0	7.89	634.31	7.53	634.67			7.60	634.60	6.40	635.80			6.79	635.41
MW-6	5298	5520	655.25	653.0	621.0	22.17	633.08	22.08	633.17			22.33	632.92	20.88	634.37			20.97	634.28
MW-7	6112	6732	641.51	638.7	618.2									18.64	622.86	19.80	621.71	18.90	622.61
MW-8	5934	7506	640.49	638.2	617.0									18.17	622.32	19.30	621.19	18.35	622.14
MW-9	4893	6991	639.05	635.9	619.3									16.54	622.51	17.57	621.48	16.62	622.43
MW-10	5200	7784	635.58	633.0	619.2											14.58	621.00	13.64	621.94
MW-11	6377	7329	640.52	637.5	617.2									5.28	635.24	6.37	634.15		
MW-12	6019	6352	642.79	639.7	619.5									6.92	635.87	7.84	634.95		
MW-13	5051	7814	634.17	631.9	619.1									3.11	631.06	4.03	630.14	3.59	630.58
MW-14	4882	6995	638.59	636.0	619.2									6.68	631.91	8.91	629.68	7.93	630.66
MW-15	4720	5002	637.91	635.2	620.3									4.12	633.79	5.07	632.84		
MW-16	5065	6596	638.54	636.3	619.5									6.42	632.12	7.05	631.49		
MW-17	5656	5677	647.10	648.3										12.18	634.92	12.87	634.23		
MW-18	5836	5748	644.88	645.4	625.4											9.74	635.14		
LW-1	4807	5070	644.61	642.4	619.0	12.22	632.39	11.81	632.80			11.78	632.83	10.69	633.92			11.12	633.49
LW-2	4662	5465	649.89	647.4	621.0	17.20	632.69	16.90	632.99			16.97	632.92	15.82	634.07				
LW-3	4483	5821	645.63	643.3		12.70	632.93	11.49	634.14			12.02	633.61	11.29	634.34				
LW-4	4229	6132	643.30	641.5	610.0	10.46	632.84	9.95	633.35			10.00	633.30	9.39	633.91			8.44	634.86
			OLD	NEW		OLD		OLD											
SG-1	5009	6167	632.77	633.28		1.65	631.12	1.56	631.21			NF		NF				2.11	631.17
SG-2	4464	6852	626.42	627.76		0.71	625.71	-0.04	626.46			2.83	624.93	4.50	621.92				
SG-3	4180	7123	629.55	632.08				-0.10	629.65			0.90	631.18	1.30	630.78				
SG-4	5228	6611	633.43	635.22		0.80	632.63	-0.03	633.46			1.40	633.82	1.22	634.00				
SG-5	5466	7713	632.47	632.47		1.98	630.49	1.87	630.60			1.53	630.94	1.68	630.79			1.81	630.66
SG-6	4494	8076	630.73	632.49		0.39	630.34	0.18	630.55			1.54	630.95	1.74	630.75				
SG-7	5406	6891	636.67	637.59		0.63	636.04	0.54	636.13	1.32	635.35	1.90	635.69	1.45	636.14			0.91	636.68
SG-8	5483	5202	636.07	636.07			dry		dry			2.91	633.16	2.30	633.77				
SG-9	3846	6336	632.59	632.59			dry		dry			NF						dry	
SG-10	6698	7263	635.39	635.39		0.47	634.92	0.41	634.98			0.38	635.01	+0.41	635.80			NF	

Notes:
(1) Blank: Indicates the data were not available.
(2) NF: Measurement location was not found for data collection.
(3) OLD/NEW: When measurement location became non-functioning, a new measurement location was installed and the new reference elevation was determined.

ACSRI Table 2-5/TJM/JAW

TABLE 2-6
SUMMARY OF PRIVATE WATER SUPPLY WELLS IN THE ACS SITE VICINITY, GRIFFITH, INDIANA

Map Number	Owner	Location	Distance From Site	Date Drilled	Screened Interval (ft.)	Formation	Use of Well(s)	Well Diameter (in.)	Static Water Level	Pumping Data	Log Available
1	Sylvester Reder	1048 Reder	300 ft. E-SE	5/3/60	51.5-56	Sand	Home	1	25	Pumped for 1 hr at 15 gpm	Yes
2	Griffith Airport	1701 E. Main St	4300 ft. E-NE	1/4/84	59-65	Sand	Public Bathroom	4			
3	Keen Foundry*	Main Street	2900 ft. N-NW	10/26/71	55-63	Sand	Industry	3	17	Pumped for 4 hrs at 30 gpm	Yes
4	Keen Foundry*	Main Street	2900 ft. N-NW	6/28/67	52-81	Sand	Industry	8	18	Pumped for 4 hrs at 175 gpm	Yes
5	Pinkstaff	743 S. Cline Ave	3000 ft SW	12/3/59	65-69		Home	1		Pumped for 1 hr at 15 gpm	Yes
6	Van Fleet	1523 E. Elm St	1.3 mile NE	11/5/59	46-50		Home	1		Pumped for 1 hr at 15 gpm	Yes
7	Russel Banister	1525 E. Elm St	1.3 mile NE	11/5/59	36-40		Home	1		Pumped for 1 hr at 15 gpm	Yes
8	Cheever Park*	301 S. Colfax St	1100 ft NE	8-24-83	54-58	Sand	Public	1.25	3	Pumped for 1 hr at 12 gpm	Yes
9	Auton Goal	1106 S. Broad St	1.1 mile S-SW	7/27/71	56-61	Sand	Home	1.25	8	Pumped for 0.5 hr at 10 gpm	Yes
10	Kirt Evans	1026 S. Arbogast St	2500 ft S	2/26/73	46-51	Sand	Home	1.25		Pumped for 2 hrs at 12 gpm	Yes
11	C. Saint-Angelo	1710 S. Arbogast St	3500 ft S	9/23/71	57-65	Sand	Home	3	15	Pumped for 2 hrs at 12 gpm	Yes
12	John Price	1105 S. Cline Ave	1.4 mile W-SW	8/12/71	52-57	Sand	Home	1.25	17	Pumped for 2 hrs at 10 gpm	Yes
13	Frank Roziek	1201 S. Cline Ave	1.5 mile W-SW	8/13/69	52-56	Sand	Home	1.25	10	Pumped for 0.5 hr at 10 gpm	Yes
14	James Cooke Jr.	1617 S. Cline Ave	2.2 mile SW	3/3/73	56-61	Sand	Home	1.25		Pumped for 2 hr at 12 gpm	Yes
15	Andrew Chmieleuiski	1699 S. Cline Ave	2.4 mile SW	6/12/73	47-52	Sand	Home	1.5		Pumped for 2 hrs at 12 gpm	Yes
17	J. Sparks	1704 S. Cline Ave	2.6 mile W-SW	8/7/84	55-63	Sand	Home	4	21	Pumped for 1.5 hrs. at 15 gpm	Yes
18	David Chorba	331 Golfview Dr	3.4 mile SW	5/11/85	28-33	Sand	Irrigation	1.5	15	Pumped at 20 gpm	Yes
19	Guy Cordy	S. Cline Ave	3400 ft W-SW	12/9/60	131	Limestone	Home	4	6	Pumped for 3 hrs at 20 gpm	Yes
20		NE 1/4,SW 1/4 Sec 35	1.2 mile N-NW	12/9/44	65-85	Sand		12	15	Pumped for 1 hr at 320 gpm	Yes
21		SW 1/4,SW 1/4 Sec 35	3900 ft N-NW	8/7/46	82	Sand		18			Yes
22		SW 1/4,SW 1/4 Sec 35	3900 ft N-NW	3/3/59				18			Yes

TABLE 2-6
SUMMARY OF PRIVATE WATER SUPPLY WELLS IN THE ACS SITE VICINITY, GRIFFITH, INDIANA

Map Number	Owner	Location	Distance From Site	Date Drilled	Screened Interval (ft.)	Formation	Use of Well(s)	Well Diameter (in.)	Static Water Level	Pumping Data	Log Available
23		SW 1/4,SW 1/4 Sec 35	1 mile N-NW	5/1/43				18			Yes
24		SW 1/4,SW 1/4 Sec 35	3800 ft NW	11/10/59				18			Yes
25		NW 1/4,SE 1/4 Sec 2	ON SITE	7/27/56	56-76	Gravel		8			Yes
26	Indiana Pipe Line Co.	SE 1/4,NE 1/4 Sec 3	1600 ft W-NW	1/23/43	56-68	Sand		8			Yes
27		NE 1/4,NW 1/4 Sec 2	1800 ft N-NE	2/5/54	86	Sand		18			Yes
28		SE 1/4,NE 1/4 Sec 3	1 mile W-NW	5/22/45	43	Sand		18			Yes
29		SW 1/4,SW 1/4 Sec 35	3300 ft N-NW	6/2/39	60	Sand					Yes
30	C&O R.R.	SE 1/4,NW 1/4 Sec 2	800 ft N-NW	12/7/51	148	Limestone		4			Yes
31	C&O R.R.	NW 1/4,SE 1/4 Sec 2	1300 ft NW	12/5/39	62-82	Sand	Industry	12	18	Pumped at 330 gmp	Yes
32	American Chemical	Colfax Street	ON SITE	9/14/71	69-74	Sand	Industry	1.25	22	Pumped for 2 hrs at 15 gpm	Yes
33	American Chemical	Colfax Street	ON SITE	2/24/72	265	Limestone	Home			Pumped for 2 hrs at 10 gpm	Yes
34	Packaging Corp (2 wells)	300 W. Main	4000 ft NW	11/10/59	54 & 86 ft TD	Sand					Yes
35	Salisbury Eng	Main St	3800 ft E-NE	5/10/72	74-82	Sand	Home	3		Pumped for 2 hrs at 18 gpm	Yes
36	Arthur Hegedus*	1009 S. Wood St	2100 ft S-SW	6/5/73	48-53	Sand	Home	1.5		Pumped for 2 hrs at 10 gpm	Yes
37	David Reder	1046 Reder Road	400 ft E	1955; 6/89	45 & 75 ft T.D.	Sand	Utility				No
38	Patricia Gatlin	1544 E. Main	3600 ft NE	1960	95 ft T.D.		Drinking/utility				No
39	Mary Johnson	1624 E. Main	4000 ft NE	66;redrilled 19	70+ ft T.D.		Home				No
40	Franklin Floyd*	1033 Reder Road	300 ft E		65 ft T.D.	Sand	Utility				No
41	Oscar Anderson	202 E. Avenue "D"	900 ft W	1948;1950	9 & 14 ft TD	and and grave	Utility				No
42	Benson Breeden	1547 E. Main	3700 ft NE	1950s	22 ft T.D.	Sand	Home				No
43	Raymond White	524 S. Lafayette	1000 ft W	1974	23 ft T.D.	Sand	Utility				No
44	Albert Bakker	1540 E. Main	3500 ft NE	1964	Unknown	Sandy gravel	Utility				No

TABLE 2-6
SUMMARY OF PRIVATE WATER SUPPLY WELLS IN THE ACS SITE VICINITY, GRIFFITH, INDIANA

Map Number	Owner	Location	Distance From Site	Date Drilled	Screened Interval (ft.)	Formation	Use of Well(s)	Well Diameter (in.)	Static Water Level	Pumping Data	Log Available
45	Robert & Muesetta Yeager	1600 E. Main	3800 ft NE	1955	58 ft T.D.	Sand	Home				No
46	Leon Charbonneau*	1043 Reder Road	300 ft E	1/88	60 ft T.D.		Home				No
47	Richard Swiss	333 South Broad St.	1400 ft NW		Unknown		Utility				No
48	John Sands	224 Avenue "D"	800 ft W	1981	28 ft T.D.		Utility				No
49	Todd Fullgraf	341 South Broad	1300 ft NW	8/88	15 ft T.D.		Utility				No
50	Anthony Cadle	345 South Broad	1300 ft NW	5/88	14 ft T.D.	Sand	Utility				No
51	Lavern & Janet Ehrhart	1549 E. Main	3500 ft NE	1983	70 ft T.D.	Sand and clay	Utility				No
52	Wilbur Bramlet	1543 E. Main	3500 ft NE	1950s	28 ft T.D.	Sand	Home				No
53	James Jaracz	113 E. Avenue "C"	1000 ft NW		15 ft T.D.		Utility				No
54	John Hines	518 S. Rensselaer	700 ft W		8 ft T.D.	Sand	Utility				No
55	Mr. Cash	2830 45th St.	2.3 miles N	7/1/59	89		Home				Yes
56	John Rosinko	2830 45th St.	2.3 miles N	10/13/59	71		Home				Yes
57	Tom Lolhema	201 Glenwood	3000 ft N								No
58	Steve Lane	118 Arbogast	2500 ft N			Sand	Lawn watering				No
59	Howard Schweitzer	208 E. Ave A.	2200 ft NW				Lawn watering				No
60	George Dorin	139 Dwiggins	2500 ft N		15		Lawn watering				No
61	Ternel	141 Dwiggins	2500 ft N		13.5		Lawn watering				No
62	Skifano	144 Dwiggins	2500 ft N		13		Lawn watering				No
63	Williams	132 Dwiggins	2500 ft N								No
64	Fowler	136 Jay	2500 ft N		9						No
65	Litia	140 Jay	2500 ft N		15						No

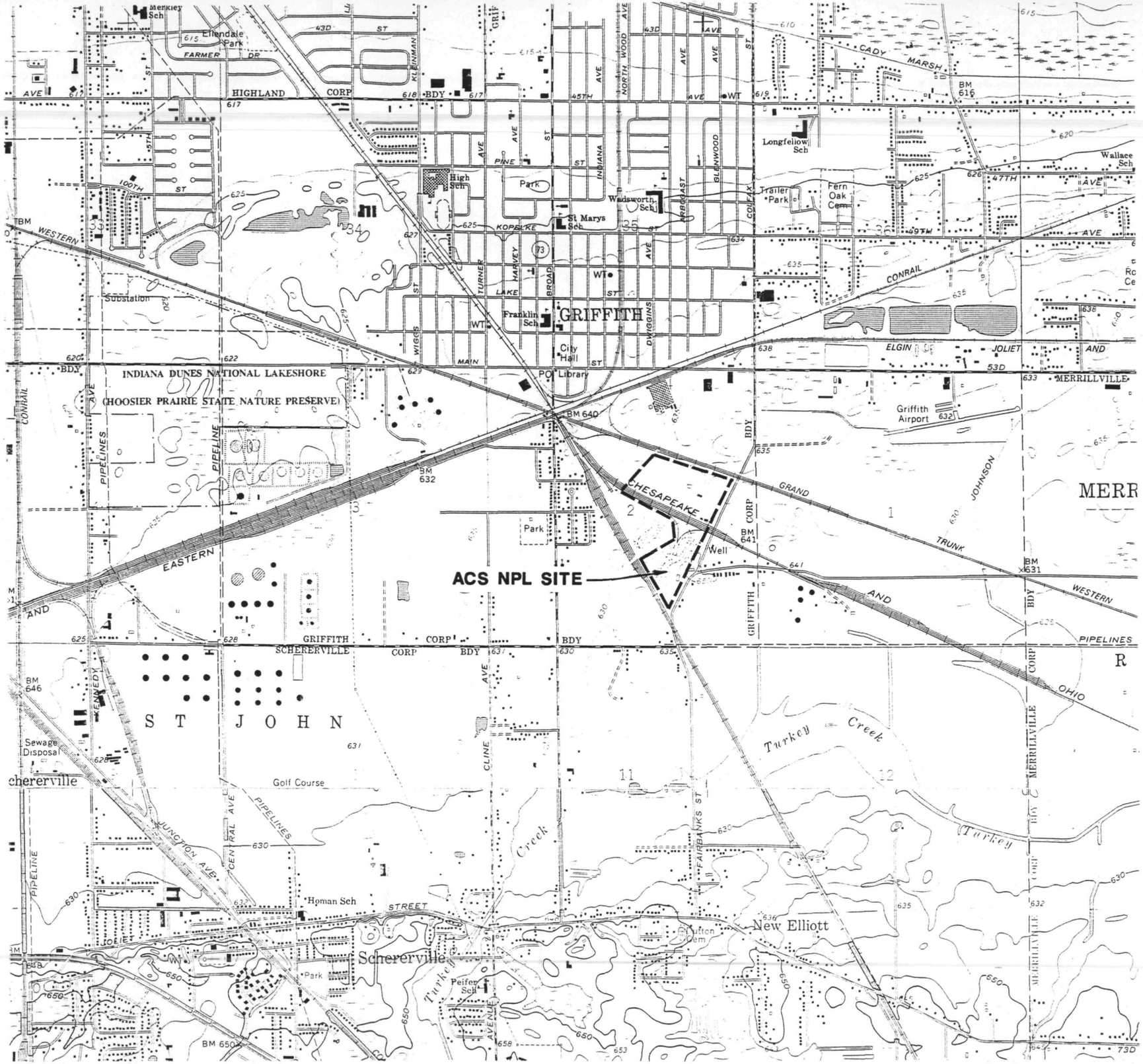
TABLE 2-6
SUMMARY OF PRIVATE WATER SUPPLY WELLS IN THE ACS SITE VICINITY, GRIFFITH, INDIANA

Map Number	Owner	Location	Distance From Site	Date Drilled	Screened Interval (ft.)	Formation	Use of Well(s)	Well Diameter (in.)	Static Water Level	Pumping Data	Log Available
68	Ron Austgen*	1002 Reder Road	200 ft E				Home				No
69	James Garmon*	1009 Reder Road	200 ft E				Home				No
70	Thomas Jones	525 S. Rensselaer	700 ft W		50-56		Irrigation				No

Notes:
A blank in the table indicates information is not available.
An asterisk (*) indicates that the well was sampled during the RI.

V251RI Table 2-6/VR/JAW

F
I
G
U
R
E
S



NOTES

1. BASE MAP DEVELOPED FROM HIGHLAND & ST. JOHN, INDIANA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS DATED 1968 AND 1962, RESPECTIVELY, PHOTOREVISED 1980.

north

0 2000 4000

SCALE IN FEET

FIGURE 1-1

Designed By
Drawn By D.L.L.
Checked By JAW
Approved By
Date 9/21/96
Reference
Revisions
Date • By • Appd

WARZYN
WARZYN ENGINEERING INC.

SITE LOCATION MAP

REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Sheet Number

Project Number 60251 B1

WARZYN

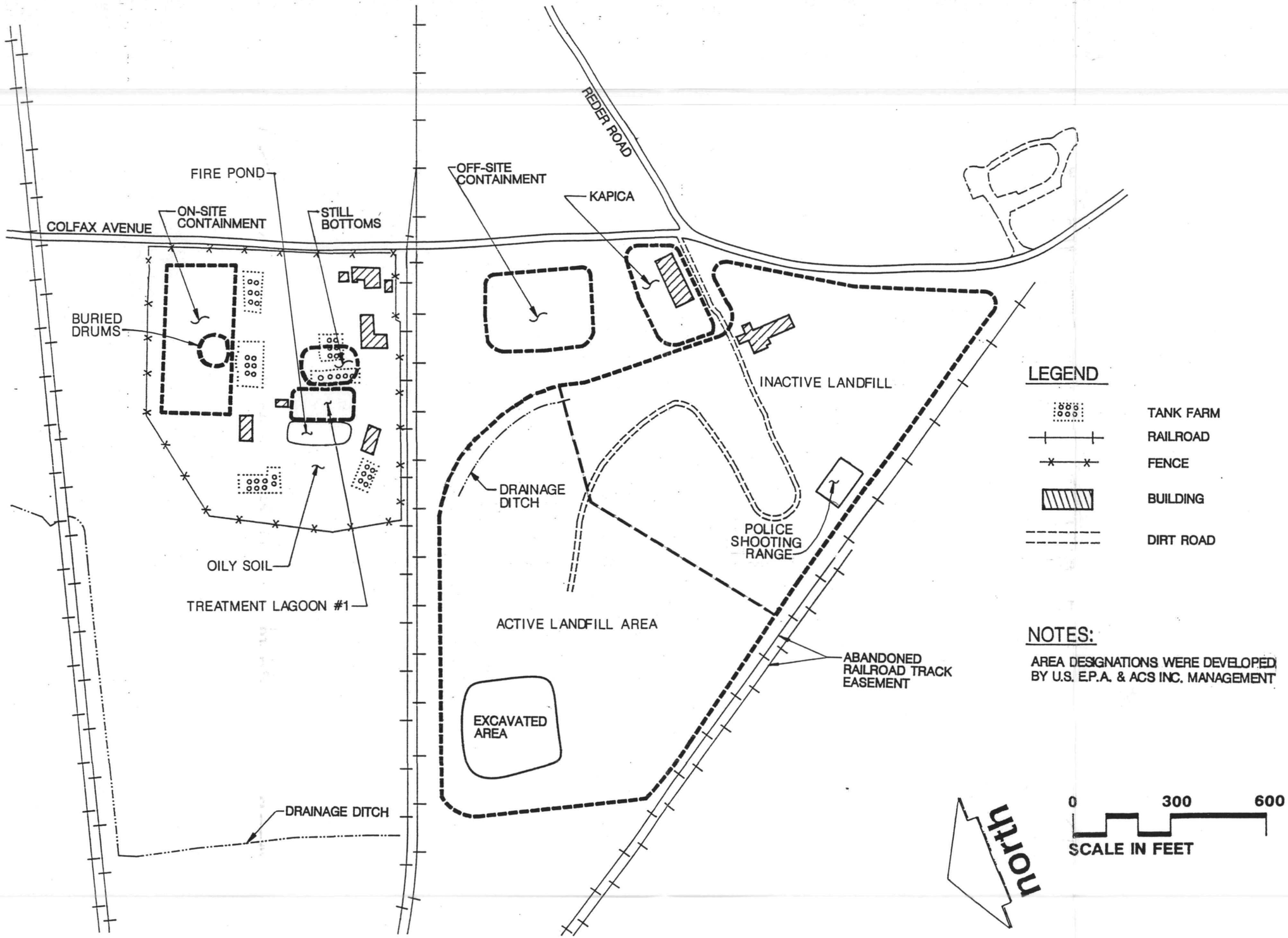


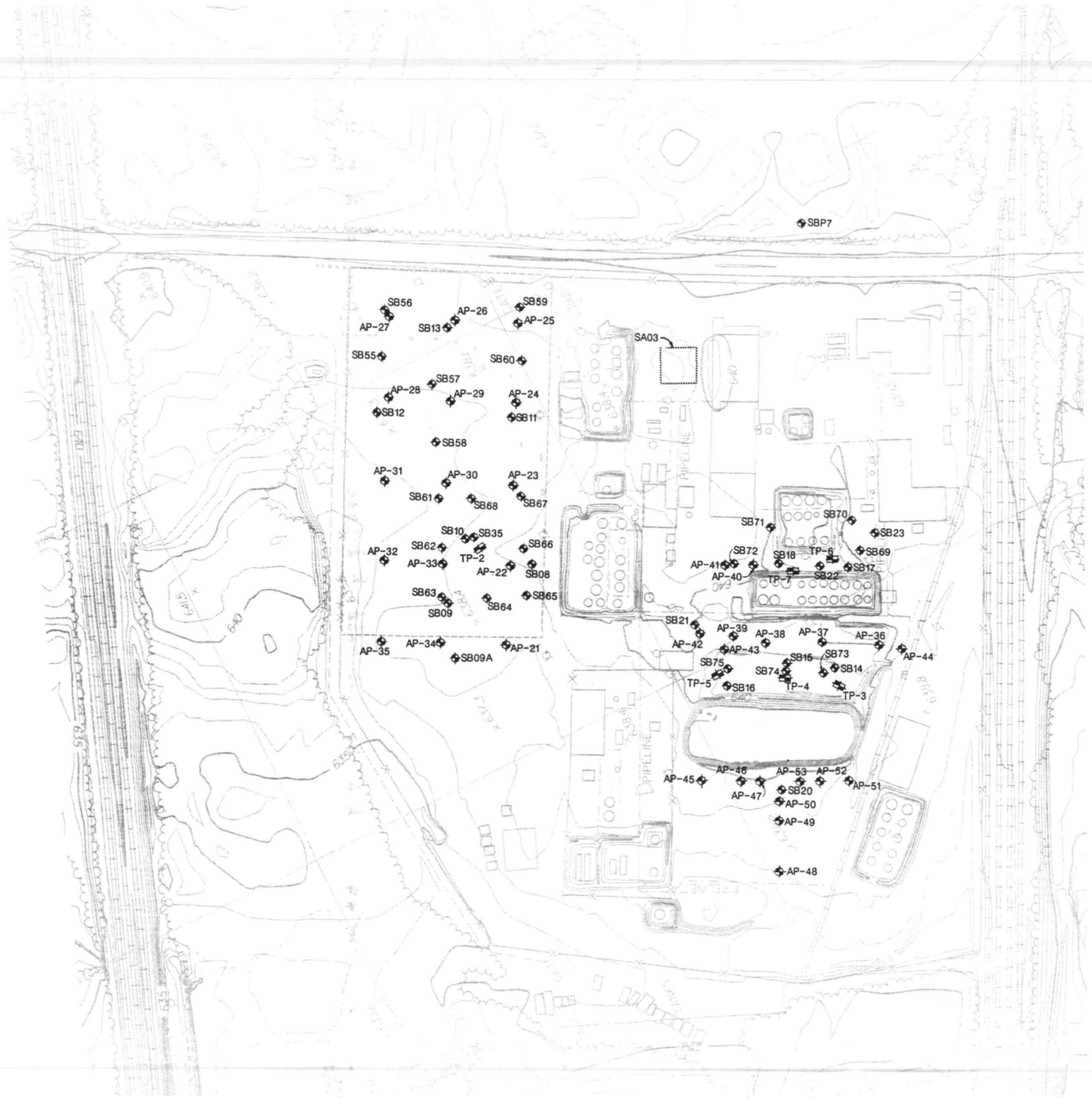
FIGURE 1-2

Designed By
Drawn By DLL, ELR
Checked By JAW
Approved By
Date 9/24/90
Reference
Revisions
Date · By · Appd

WARZYN
WARZYN ENGINEERING INC.

WASTE BURIAL AREAS
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFITH, INDIANA

Sheet Number
Project Number 60251 B2
WARZYN



LEGEND

----	GEOPHYSICS INVESTIGATION AREA
SB-01	SOIL BORING LOCATION & NUMBER
AP-01	AUGER PROBE LOCATION & NUMBER
TP-1	TEST PIT LOCATION & NUMBER
SA01	SOIL AREA LOCATION & NUMBER

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. SOIL BORINGS SB01 TO SB18 AND AUGER PROBES AP-1 TO AP-44 FOR PHASE I WERE DRILLED BY EXPLORATION TECHNOLOGY INC. (ETI) UNDER THE SUPERVISION OF WARZYN IN AUGUST AND SEPTEMBER 1989.
4. SOIL BORINGS SB20 TO SB75 AND AUGER PROBES AP-45 TO AP-53 FOR PHASE II WERE DRILLED BY EXPLORATION TECHNOLOGY INC. (ETI) UNDER THE SUPERVISION OF WARZYN IN MAY AND JUNE 1990.
5. LOCATIONS FOR SOIL BORINGS WITH SAMPLING AND TEST PITS WERE FIELD LOCATED BY EWI ENGINEERING ASSOC. SURVEYORS.
6. LOCATIONS OF AUGER PROBES ARE APPROXIMATE.
7. SOIL BORING NUMBERS SB19 AND SB34 DO NOT EXIST.

north

0 150 300

SCALE IN FEET

FIGURE 2-1

Designed By T.J.M. Drawn By D.L.L. Checked By JAW
Approved By [signature] Date 9/21/90
Reference

WARZYN ENGINEERING INC.

Date • By • App'd. Revisions

SOIL BORING, AUGER PROBE & TEST PIT LOCATIONS (ON-SITE)
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number 60251 B3

WARZYN

LEGEND

- ---- GEOPHYSICS INVESTIGATION AREA
- SB-01 SOIL BORING LOCATION & NUMBER
- AP-01 AUGER PROBE LOCATION & NUMBER
- TP-1 TEST PIT LOCATION & NUMBER
- SA01 SOIL AREA LOCATION & NUMBER

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. SOIL BORINGS SB01 TO SB18 AND AUGER PROBES AP-1 TO AP-44 FOR PHASE I WERE DRILLED BY EXPLORATION TECHNOLOGY INC. (ETI) UNDER THE SUPERVISION OF WARZYN IN AUGUST AND SEPTEMBER 1989.
4. SOIL BORINGS SB20 TO SB75 AND AUGER PROBES AP-45 TO AP-83 FOR PHASE II WERE DRILLED BY EXPLORATION TECHNOLOGY INC. (ETI) UNDER THE SUPERVISION OF WARZYN IN MAY AND JUNE 1990.
5. LOCATIONS FOR SOIL BORINGS WITH SAMPLING AND TEST PITS WERE FIELD LOCATED BY EWI ENGINEERING ASSOC. SURVEYORS.
6. LOCATIONS OF AUGER PROBES ARE APPROXIMATE.
7. SOIL BORING NUMBERS SB19 AND SB34 DO NOT EXIST.

north

0 150 300

SCALE IN FEET

FIGURE 2-2

Designed By: TSM
Drawn By: D.L.L.
Checked By: TAW
Approved By: [signature]
Date: 9/21/90
Reference:

Date • By • Appd. WARZYN
WARZYN ENGINEERING INC.

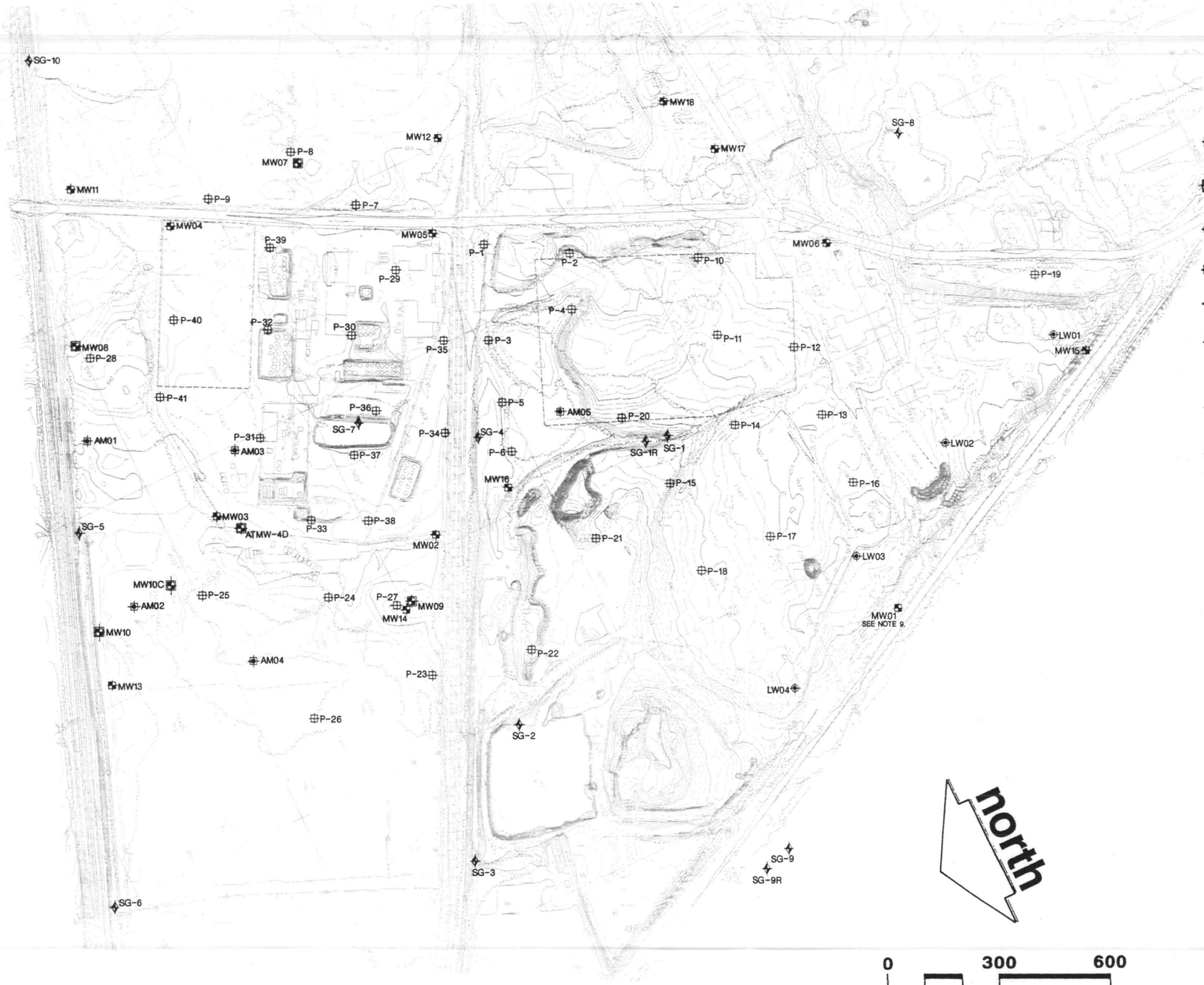
SOIL BORING, AUGER PROBE & TEST PIT LOCATIONS (OFF-SITE)

Revisions

REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number 60251 B4

WARZYN



LEGEND

----	GEOPHYSICS INVESTIGATION AREA
MW01	UPPER AQUIFER MONITORING WELL LOCATION & NUMBER
MW10	LOWER AQUIFER MONITORING WELL LOCATION & NUMBER
LW01	LEACHATE HEADWELL LOCATION & NUMBER
P-1	PIEZOMETER LOCATION & NUMBER
SG-1	STAFF GAUGE LOCATION & NUMBER
AM01	AQUIFER MATRIX SAMPLE LOCATION & NUMBER

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC. ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH.
2. MONITORING WELL MW01, STAFF GAUGES SG1 AND SG9 HAVE BEEN DESTROYED. STAFF GAUGES SG-1R AND SG-9R ARE THE CORRESPONDING REPLACEMENT STAFF GAUGES.
3. VERTICAL SITE DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
4. MONITORING WELL ATMW-4D WAS DRILLED AND INSTALLED BY ATEC ENGINEERING ASSOC. ON SEPTEMBER 27, 1985. THE LOCATION OF ATMW-4D IS APPROXIMATE.
5. MONITORING WELL MW01 TO MW06 WERE DRILLED AND INSTALLED BY EXPLORATION TECHNOLOGY INC (ETI) UNDER THE SUPERVISION OF WARZYN DURING THE PHASE I INVESTIGATION IN JULY 1989.
6. MONITORING WELL MW07 TO MW18 WERE DRILLED AND INSTALLED BY EXPLORATION TECHNOLOGY INC (ETI) UNDER THE SUPERVISION OF WARZYN DURING THE PHASE II INVESTIGATION IN MARCH THROUGH JUNE 1990.
7. LOCATIONS OF MONITORING WELLS, PIEZOMETERS, AND SURFACE WATER STAFF GAUGES WERE FIELD LOCATED BY EWI ENGINEERING ASSOC. SURVEYORS.
8. STAFF GAUGES ARE CONSTRUCTED OF IRON POLES AND WERE INSTALLED BY WARZYN.
9. MONITORING WELL MW-01 WAS DESTROYED BY ROAD CONSTRUCTION DURING SPRING 1990.

FIGURE 2-3

Checked By: JAW
Drawn By: D.L.L.
Designed By: TSW
Approved By:
Date: 9/21/90
Reference:

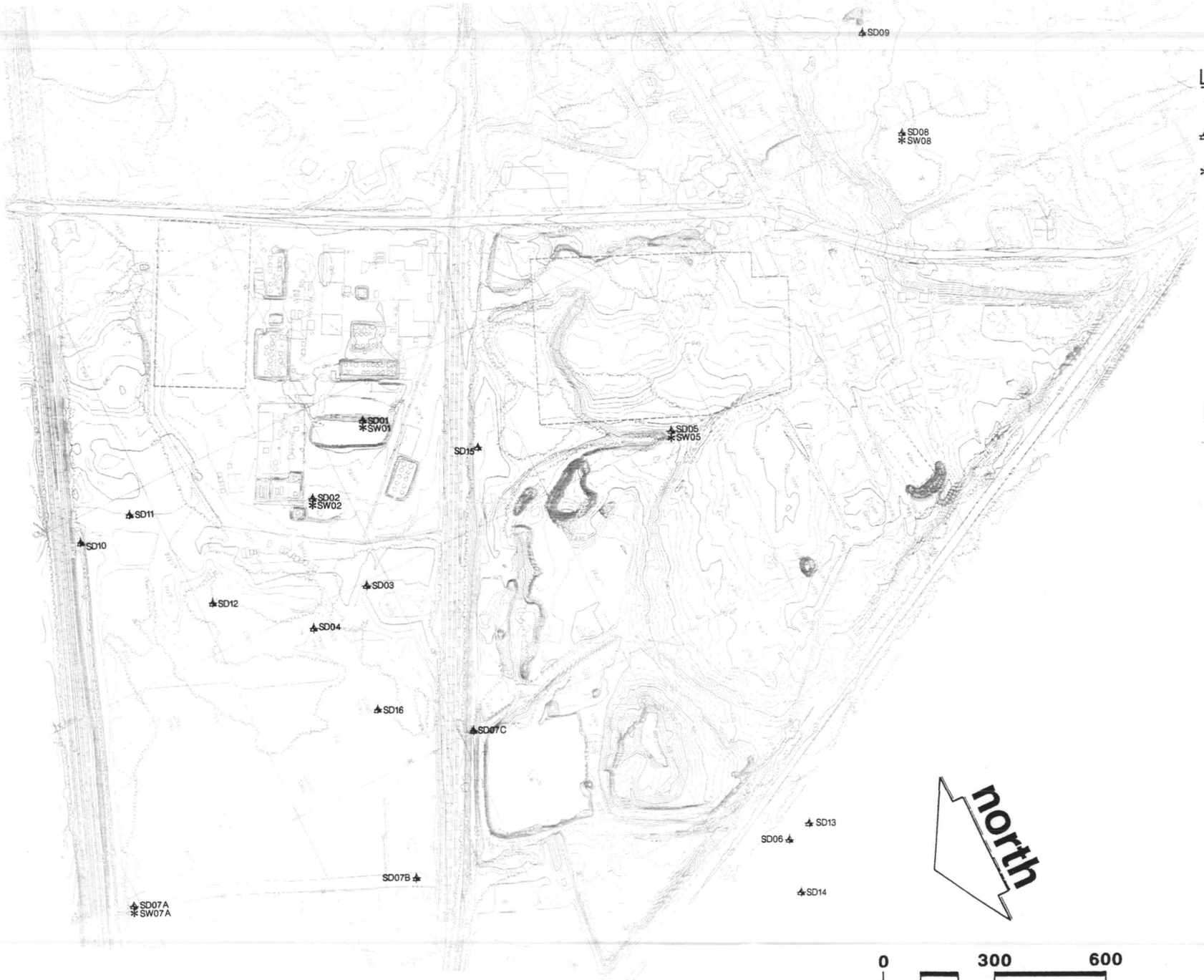
Date • By • App'd.

WARZYN
WARZYN ENGINEERING INC.

MONITORING WELL, LEACHATE WELL, PIEZOMETER & STAFF GAUGE LOCATIONS
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number
60251 B5

WARZYN



LEGEND

----	GEOPHYSICS INVESTIGATION AREA
SD01	SEDIMENT SAMPLE LOCATION & NUMBER
SW01	SURFACE WATER SAMPLE LOCATION & NUMBER

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. SURFACE WATER AND SEDIMENT SAMPLES WERE COLLECTED BY WARZYN. PHASE I SAMPLES SD01 THROUGH SD09 AND SW01, SW02, SW05, SW07A AND SW08 WERE COLLECTED IN JULY 1989. PHASE II SEDIMENT SAMPLES SD10 THROUGH SD14 WERE COLLECTED ON MAY 23, 1990. PHASE II SAMPLES SD15 AND SD16 WERE COLLECTED ON JULY 3, 1990 AND RESAMPLED FOR VOCS ONLY ON JULY 25, 1990.
4. LOCATIONS OF SURFACE WATER AND SEDIMENT SAMPLES WERE FIELD LOCATED BY EWI ENGINEERING ASSOC. SURVEYORS.

north

0 300 600

SCALE IN FEET

FIGURE 2-4

Designed By FJM | Drawn By D.L.L. | Checked By JAW | Approved By PJV | Date 9/21/90 | Reference

WARZYN ENGINEERING INC.

Revisions | Date - By - Appd

SURFACE WATER & SEDIMENT SAMPLING LOCATIONS

REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number 60251 B6

WARZYN

LEGEND

- ---- GEOPHYSICS INVESTIGATION AREA
- ●GW1 GROUNDWATER SAMPLING POINT LOCATION & NUMBER

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. ALL GROUNDWATER SAMPLE POINTS WERE PART OF A SHALLOW GROUNDWATER INVESTIGATION PERFORMED BY TRACER RESEARCH CORPORATION UNDER SUPERVISION BY WARZYN ENGINEERING INC. (MARCH 26, 1990 THROUGH APRIL 2, 1990).
4. GROUNDWATER WAS COLLECTED BY DRIVING HOLLOW PROBES WITH DETACHABLE DRIVE POINTS TO A SPECIFIED DEPTH BELOW THE WATER TABLE. A GROUNDWATER SAMPLE WAS COLLECTED IN A 40 ML VOC VIAL. THE HEADSPACE OF EACH SAMPLE WAS ANALYZED FOR BENZENE, ETHYL BENZENE, TOLUENE, XYLENES, AND TOTAL PETROLEUM HYDROCARBONS USING A POTABLE VARIAN 3300 (FID) GAS CHROMATOGRAPH. ALL SAMPLE AND ANALYTICAL EQUIPMENT WAS CONTAINED IN A 4-WHEEL DRIVE TRACER VAN.
5. GROUNDWATER SAMPLE POINT LOCATIONS ARE APPROXIMATE.
6. REPORT OF FINDINGS IS COMPILED IN APPENDIX J.

FIGURE 2-5

Designed By: TJM
Drawn By: D.L.L.
Checked By: JAW
Approved By: PJV
Date: 9/21/90
Reference:

WARZYN
WARZYN ENGINEERING INC.

Revisions
No. | Date | By | App'd.

TRACER RESEARCH GROUNDWATER SAMPLING POINTS
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number 60251 B7

WARZYN

MASTER BLUE PRINT INC. 516248
Work Order No.
Sheet No.
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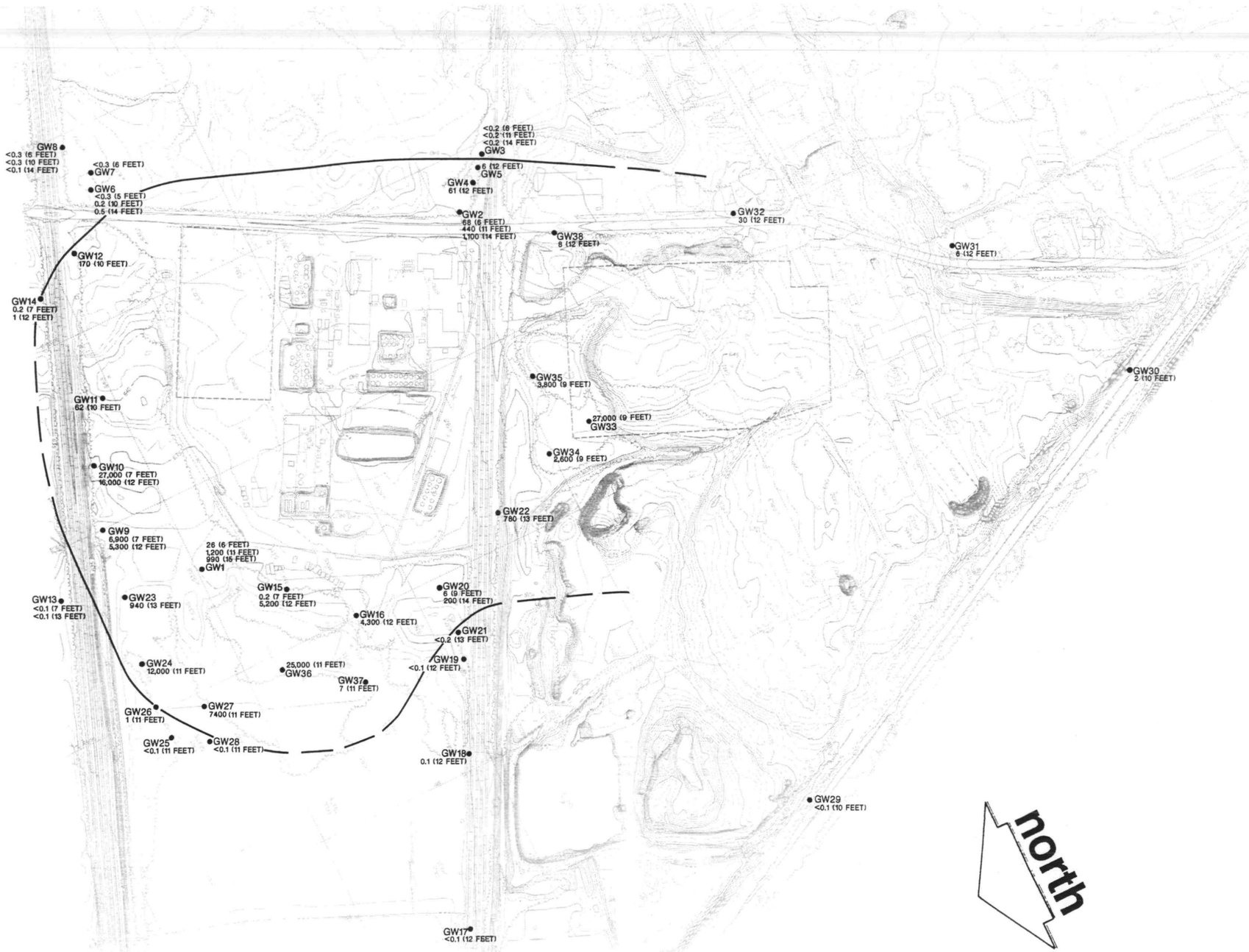

LEGEND

- ---- GEOPHYSICS INVESTIGATION AREA
- ●GW1 GROUNDWATER SAMPLING POINT LOCATION & NUMBER
- 2,400 TOTAL BENZENE CONCENTRATION MEASURED IN GROUNDWATER (ug/l)
- (6 FEET) SAMPLING DEPTH IN FEET BELOW GROUND SURFACE
- —— ESTIMATED OUTER HORIZONTAL EXTENT OF BENZENE PLUME – AT OR < 1.0 ug/l BENZENE (DASHED WHERE INFERRED)

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. ALL GROUNDWATER SAMPLE POINTS WERE PART OF A SHALLOW GROUNDWATER INVESTIGATION PERFORMED BY TRACER RESEARCH CORPORATION UNDER SUPERVISION BY WARZYN ENGINEERING INC. (MARCH 26, 1990 THROUGH APRIL 2, 1990).
4. GROUNDWATER WAS COLLECTED BY DRIVING HOLLOW PROBES WITH DETACHABLE DRIVE POINTS TO A SPECIFIED DEPTH BELOW THE WATER TABLE. A GROUNDWATER SAMPLE WAS COLLECTED IN A 40 ML VOC VIAL. THE HEADSPACE OF EACH SAMPLE WAS ANALYZED FOR BENZENE, ETHYL BENZENE, TOLUENE, XYLENES, AND TOTAL PETROLEUM HYDROCARBONS USING A POTABLE VARIAN 3300 (FID) GAS CHROMATOGRAPH. ALL SAMPLE AND ANALYTICAL EQUIPMENT WAS CONTAINED IN A 4-WHEEL DRIVE TRACER VAN.
5. GROUNDWATER SAMPLE POINT LOCATIONS ARE APPROXIMATE.
6. REPORT OF FINDINGS IS COMPILED IN APPENDIX J.

FIGURE 2-6

Designed By TSM Drawn By D.L.L. Checked By JAW
Approved By PJV Date 9/24/90
Reference
Revisions
Date • By • Appd.
WARZYN ENGINEERING INC.

SUMMARY OF RESULTS OF TRACER RESEARCH INVESTIGATION
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Project Number 60251 B8

LEGEND

- UPPER AQUIFER PRIVATE WELL LOCATION
- LOWER AQUIFER PRIVATE WELL LOCATION
- (PW01) PRIVATE WELL SAMPLING LOCATION

NOTES

1. BASE MAP DEVELOPED FROM HIGHLAND & ST. JOHN, INDIANA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS DATED 1968 AND 1962 RESPECTIVELY, PHOTOREVISED 1980.
2. PRIVATE WELL DATA WAS OBTAINED FROM THE INDIANA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER WELL LOGS, OR A USEPA SURVEY, OR A WARZYN DOOR TO DOOR SURVEY.
3. SUMMARY OF PRIVATE WELLS LOCATED ON THIS MAP IS INCLUDED IN TABLE 2-6.
4. INDIANA DEPARTMENT OF NATURAL RESOURCES WELL LOGS ARE INCLUDED IN APPENDIX L.
5. PRIVATE WELL SAMPLING WAS CONDUCTED BY WARZYN ENGINEERING INC. ON JUNE 13 & 14, 1990.

north

0 2000 4000

SCALE IN FEET

FIGURE 2-7

Designed By TBM
Drawn By D.L.L.
Checked By JAW
Approved By
Date 9/21/90
Reference
Revisions
Date • By • Appd

WARZYN
WARZYN ENGINEERING INC

PRIVATE WELL LOCATION MAP
REMEDIAL INVESTIGATION
AMERICAN CHEMICAL SERVICES
NPL SITE
GRIFFITH, INDIANA

Sheet Number
Project Number 60251 B9
WARZYN